NG 23 (GROUP B)   No.

Time : 2 hours   Maximum marks : 100

Name of the
Candidate : ....

Signature of
the Candidate : ....

Regn.
Number :

Subject code for Part III

INSTRUCTIONS TO CANDIDATES

1. Write your Name and Registration Number (as found in the HALL TICKET) and sign in the space provided above.

2. Do not open the Question Book until the Hall Superintendent gives the signal for doing so.

3. The Question Book has **3 parts.** You have to answer Part I, Part II and the subject printed in the hall ticket for the Part III.

4. **Each correct answer carries 1 mark and for every wrong answer $\frac{1}{3}$ mark will be deducted.**

   The marks allotted to various parts are as follows :

   Part I : 20 marks and **Part II : 20 marks**

   Under Part II all correct answers upto a **maximum number of 20** will be given credit; but all wrong answers will be taken into account for negative marking.

5. The last few pages of the Question Book are blank, except for the words 'FOR ROUGH WORK'. You can make any relevant rough calculations there.

6. After commencement of the examination, open the Question Book and take out the **Answer Sheet.** If the Question Book or the Answer Sheet or both are not in good condition, ask for their immediate replacement. No replacement will be made 5 minutes after the commencement of the examination.

7. In the Answer Sheet
   (a) Use black ball point pen for all shading and writing.
   (b) In the space provided, write your Registration Number and shade.
   (c) In the space provided, write the subject code, as printed in the hall ticket
   (d) In the space provided, write the name of the examination centre.
   (e) Put your signature in the space provided.

8. Shade in the space provided against each question number in the Answer Sheet, one of the four alternatives a, b, c, d which according to you corresponds to the correct answer.

9. Use the Answer Sheet carefully. No spare Answer Sheet will be given.

10. At the end of the examination, when the Hall Superintendent announces 'Stop Writing', you must **stop writing immediately** and hand over the Answer Sheet to Hall Superintendent.

11. When you have completed answering, stand up and remain in your place. The Hall Superintendent will come to you and collect your Answer Sheet. Under no circumstances should be taken out of the Examination Hall. No candidate shall leave the Hall until the Answer Sheet is collected.

12. Calculator, tables or any other calculating devices and cell phone are strictly prohibited for this examination.

NG 23 (GROUP B)

PART I — ENGINEERING MATHEMATICS

(Common to all Candidates)

(Answer ALL questions)

1. The rank of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 2 & 3 \end{pmatrix}$ is

 a. 0

 b. 1

 c. 2

 d. 3

2. The eigen values of the matrix $\begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix}$ are

 a. 2, 2

 b. 2, –2

 c. $i, -i$

 d. $2i, -2i$

3. The eigen values of the matrix corresponding to the quadratic form $2x_1 x_2 + 2x_1 x_3 - 2x_2 x_3$ are 1, 1, –2. Then, the canonical form of the given quadratic form is

 a. $2y_1^2 + y_2^2 - y_3^2$

 b. $y_1^2 + 2y_2^2 - y_3^2$

 c. $y_1^2 + y_2^2 - 2y_3^2$

 d. $y_1^2 + y_2^2 + 2y_3^2$

4. A flat circular plate is heated so that the temperature at any point (x, y) is $u(x, y) = x^2 + 2y^2 - x$. The coldest point on the plate is

 a. $\dfrac{1}{4}$

 b. $-\dfrac{1}{4}$

 c. $\dfrac{1}{2}$

 d. $-\dfrac{1}{2}$

5. The solution of the ordinary differential equation

 $$(x + 2)^2 \frac{d^2 y}{dx^2} - (x + 2)\frac{dy}{dx} + y = 3x + 4$$

 is

 a. $y = A e^x + B e^{-x} + \dfrac{2}{5}\log(x + 2) - 4$

 b. $y = A(x + 2) + B e^x +$
    $$\dfrac{2}{5}[\log(x + 2)]^2 - 2$$

 c. $y = A\log(x + 2) + B(x + 2) +$
    $$\dfrac{2}{5}\log(x + 2) - 2$$

 d. $y = [A\log(x + 2) + B](x + 2) +$
    $$\dfrac{3}{2}[\log(x + 2)]^2 (x + 2) - 2$$

6. The complete integral of the partial differential equation $q^2 = z^2 p^2 (1 - p^2)$ is

 a. $az = (y + ax + c)^2 + 1$

 b. $a^2 z^2 = ax + y + c$

 c. $a^2 - z^2 = (y + ax + c)^2$

 d. $a^2 z^2 = (y + ax + c)^2 + 1$

7. The value of the integral $\int_C \left[(2x - y)\,dx - yz^2 dy - y^2 z\,dz\right]$, where C is the circle $x^2 + y^2 = 1$, corresponding to the surface of the sphere of unit radius, is

a. $\dfrac{\pi}{2}$

b. π

c. $\dfrac{3\pi}{2}$

d. 2π

8. The value of $\iint_S \vec{F} \cdot \hat{n}\, dS$, where $\vec{F} = (2x + 3z)\vec{i} - (xz + y)\vec{j} + (y^2 + 2z)\vec{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = 9$ with volume V, is

a. V

b. $2V$

c. $3V$

d. $4V$

9. The volume of the solid bounded by planes $x = 0$, $y = 0$, $x + y + z = a$ and $z = 0$ is given by

a. $\dfrac{a^3}{6}$

b. $\dfrac{5a^2}{8}$

c. $\dfrac{a^3}{8}$

d. $\dfrac{5a^2}{6}$

10. The curve $u(x, y) = C$ and $v(x, y) = C'$ are orthogonal if

a. $u + iv$ is an analytic function

b. $u - iv$ is an analytic function

c. $u - v$ is an analytic function

d. $u + v$ is an analytic function

11. The function $f(z) = |z^2|$ is

a. everywhere analytic

b. nowhere analytic

c. analytic only at $z = 0$

d. analytic except at $z = 0$

12. The singularity of the function $\dfrac{z - \sin z}{z^2}$ is,

a. $z = -2$

b. $z = 2$

c. $z = 0$

d. $z = 4$

13. The inverse Z-transform of $X(z) = \dfrac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$, given the region of convergence as $|z| > 1$ is

a. {1, 3/2, 7/4, 15/8, 31/16, ...}

b. {1, 2/3, 4/7, 8/15, 16/31, ...}

c. {1/2, 3/4, 7/8, 15/16, 31/32, ...}

d. {0.25, 0.75, 0.125, 1.5, 0.0525, ...}

14. The inverse Laplace transform of $\dfrac{(s+2)}{s(s+3)(s+4)}$ is

   a. $\dfrac{1}{6} + \dfrac{1}{3}e^{-3t} + \dfrac{1}{2}e^{-4t}$

   b. $\dfrac{1}{6} - \dfrac{1}{3}e^{-3t} + \dfrac{1}{2}e^{-4t}$

   c. $1 - 3e^{-3t} + 2e^{-4t}$

   d. $\dfrac{1}{6} + \dfrac{1}{3}e^{-3t} - \dfrac{1}{2}e^{-4t}$

15. Which of the following functions is self-reciprocal with respect to Fourier cosine transform?

   a. $e^{-\frac{x^2}{2}}$

   b. $\dfrac{1}{\sqrt{x}}$

   c. $\sqrt{\dfrac{2}{\pi}}\cos x$

   d. $\sqrt{\dfrac{2}{\pi}}\sin x$

16. Which of the following methods is iterative for solving a system of linear algebraic equations?

   a. Gauss-Jordan method

   b. Gauss elimination method

   c. Fixed point iteration method

   d. Gauss-Jacobi method

17. The nature of the nth divided differences of a polynomial of nth degree is

   a. of degree n

   b. constant

   c. of degree $n+1$

   d. of degree $n-1$

18. The error in Simpson's $\dfrac{1}{3}$ rule is of order

   a. $O\left(h^3\right)$

   b. $O\left(h^4\right)$

   c. $O\left(h^2\right)$

   d. $O\left(h\right)$

19. Let X be a random variable such that $E(X) = 2$ and $E\left(X^2\right) = 7$, then $Var(X)$ is

   a. 5

   b. 4

   c. 3

   d. 2

20. If the moment generating function of a random variable X is given by $M_X(t) = \dfrac{2}{2-t}$, then the value of $E(X)$ is

   a. 1

   b. 2

   c. 1/2

   d. 1/3

PART II — BASIC ENGINEERING AND SCIENCES

(Common to all candidates)

(All correct answers upto a maximum number of 20 will be given credit, but all wrong answers will be taken into account for negative marking)

21. Which of the following deals with thermal equilibrium and provides a means for measuring temperatures?

    a. Zeroth law

    b. First law

    c. Second law

    d. Third law

22. An ideal fluid is

    a. a real fluid

    b. viscous

    c. compressive and gaseous

    d. incompressible and frictionless

23. $bh^3/6$ is the moment of inertia of

    a. Rectangle of width b and height h about the axis through its centroid

    b. Rectangle of width b and height h about the axis through its base

    c. Isosceles triangle of width b and height h about the axis through its centroid

    d. Isosceles triangle of width b and height h about the axis through its base

24. Biological oxygen demand (BOD) primarily measures

    a. Types of microbes

    b. Level of dissolved oxygen

    c. Quantity of organic matter

    d. Quantity of dissolved impurities

25. A DC series motor should not be run at no load, because it will

    a. draw excess current

    b. not start and damage the motor

    c. run at a dangerously high speed

    d. not develop starting torque

26. A given application runs for 15 seconds on a desk top processor. When the compiler used for the application is optimized, it requires only 0.6 as many instructions as the old compiler, but the CPI increases by 1.1. How much time will the application take to run with the new compiler?

    a. 9.9 seconds

    b. 8.2 seconds

    c. 25.5 seconds

    d. 0.044 seconds

27. Which of the following statements is false?

    a. SRAM is very fast

    b. SRAM is used for cache

    c. values stored in DRAM exist indefinitely as long as there is power

    d. DRAM is used in main memory

28. When does the Array Index Out Of Bounds Exception occur in JAVA?

    a. Compile-time

    b. Run-time

    c. When an array is declared

    d. When an array is printed

29. What does the following declaration mean?

    int (*ptr)[10];

    a. ptr is array of pointers to 10 integers

    b. ptr is a pointer to an array of 10 integers

    c. ptr is an array of 10 integers

    d. ptr is an pointer to array

30. Predict the output of the code

```
void m();
void n()
{
m();
}
void main()
{
void m()
{
printf("Welcome");
}
}
```

    a. Welcome
    b. Compile time error
    c. Nothing
    d. Varies

31. An Ideal heat engine operates between two temperatures 600 K and 900 K. What is the efficiency of the engine?
    a. 50%
    b. 80%
    c. 10%
    d. 33%

32.

	List – I		List – II
(A)	Heat to work	1.	Nozzle
(B)	Heat to Lift Weight	2.	Endothermic chemical reaction
(C)	Heat to strain energy	3.	Heat engine
(D)	Heat to electromagnetic energy	4.	Hot air balloon/evaporation
		5.	Thermal radiation
		6.	Bimetallic strips

Codes :

|	(A)	(B)	(C)	(D)
a.	3	4	6	5
b.	3	4	5	6
c.	3	6	4	2
d.	1	2	3	4

33. A frictionless piston-cylinder device contains a gas initially at 0.8 MPa and 0.015 m³. It expands quasi-statically at constant temperature to a final volume of 0.030 m³. The work output (in kJ/kg) during this process will be
    a. 8.32
    b. 12
    c. 554.67
    d. 8320

34. Thermodynamic work is the product of
    a. Two intensive properties
    b. Two extensive properties
    c. An intensive property and change in an extensive property
    d. An extensive property and change in an intensive property

35. In the temperature-entropy diagram of a vapour shown in the given figure, the thermodynamic process shown by the dotted line AB represents
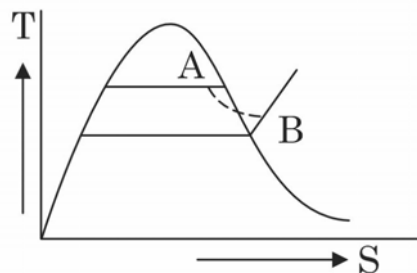
    a. Hyperbolic expansion
    b. Free expansion
    c. Constant volume expansion
    d. Polytropic expansion

36. The specific conductance of the electrolyte ————— on dilution.
    a. Increases
    b. Decreases
    c. Slightly increases
    d. Cannot be determined

37. The process of decomposition of an electrolyte by passing electric current through its solution is called as
    a. Electrolyte
    b. Electrode
    c. Electrolysis
    d. Electrochemical cell

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38. The correct order of different types of energies is
   a. $E_{el} \gg E_{vib} \gg E_{rot} \gg E_{tr}$
   b. $E_{el} \gg E_{rot} \gg E_{vib} \gg E_{tr}$
   c. $E_{el} \gg E_{vib} \gg E_{tr} \gg E_{rot}$
   d. $E_{tr} \gg E_{vib} \gg E_{rot} \gg E_{el}$

39. The cuprous chloride used in Orsat apparatus can absorb
   a. Only carbon monoxide
   b. Both carbon monoxide and carbon dioxide
   c. Both carbon monoxide and oxygen
   d. All carbon monoxide, carbon dioxide and oxygen

40. Incomplete combustion of a fuel is characterised by the high ————— in the flue gas
   a. Smoke
   b. Temperature
   c. Oxygen
   d. Carbon monoxide

41. The rating of an electric lamp is 220 V and 100 W. If it is operated at 110 V, the power consumed by it will be:
   a. 50 W
   b. 75 W
   c. 90 W
   d. 25 W

42. An Ideal current source should have
   a. Zero internal resistance
   b. Infinite internal resistance
   c. Large value of EMF
   d. None of the above

43. A pony motor is basically a
   a. DC series motor
   b. DC shunt motor
   c. Double – winding AC/DC motor
   d. Small Induction motor

44. Two coils, connected in parallel across 100 V DC supply mains, takes 10 A from mains. The power dissipated in one coil is 600 W. The resistance of each coil is:
   a. $R_1 = 16.67\ \Omega$ and $R_2 = 25\ \Omega$
   b. $R_1 = 14.62\ \Omega$ and $R_2 = 10\ \Omega$
   c. $R_1 = 5.67\ \Omega$ and $R_2 = 9\ \Omega$
   d. $R_1 = 7\ \Omega$ and $R_2 = 3\ \Omega$

45. In electrostatic instrument for the linear motion, the force between plates is given by
   a. $F = \dfrac{1}{2}V^2C^2$
   b. $F = \dfrac{1}{2}m^2C^2$
   c. $F = \dfrac{1}{2}V^2\dfrac{dc}{dx}$
   d. $F = V^2C^2$

46. You have probably noticed that during a thunderstorm you see a lightning flash some time before you hear the thunder. That is because
   a. the thunder is generated only after the lightning has stopped
   b. lightning and thunder are unrelated events
   c. light travels a lot faster than sound
   d. sound travels a lot faster than light

47. In Young's double slit experiment, if one of the slits is covered with the blue and another one with red transparent papers,
   a. fringe width changes
   b. interference pattern is not observed
   c. multicolour fringes are observed
   d. circular fringes are formed

48. According to Plancks Quantum theory, the second energy level of a one second simple pendulum is

    a. 6.625×10^{-34} J

    b. 3.312×10^{-34} J

    c. 13.25×10^{-34} J

    d. 16.562×10^{-34} J

49. The principle behind fibre optic communication is

    a.   partial reflection

    b.   partial refraction

    c.   total internal refraction

    d.   total internal reflection

50. In which one of the following it is not possible to achieve laser action?

    a.   two level system

    b.   multi level system

    c.   four level system

    d.   seven level system

51. Dielectric loss is the phenomenon in which the electrical energy is converted into

    a.   dipole energy

    b.   light radiation

    c.   liquid plasma

    d.   heat

52. In Ferri magnetic materials in dual dipoles are

    a.   parallel to each other with unequal moments

    b.   antiparallel to each other with unequal moments

    c.   antiparallel to each other with equal moments

    d.   parallel to each other with equal moments

53. An electric bulb rated 200 V and 100 W is connected a 160 V power supply. What power will be consumed by the bulb?

    a.   64 W

    b.   80 W

    c.   100 W

    d.   160 W

54. Donar levels in an extrinsic n type semi conductors lie just

    a.   above the conduction band

    b.   below the conduction band

    c.   above the valence band

    d.   below the valence band

55. Which one of the following is false about super conductors?

    a.   super conductors have no resistance

    b.   electric current can destroy super conductivity

    c.   superconductors are diamagnetic

    d.   superconductors allow magnetic field to pass through only below the critical temperature

06 – AUTOMOBILE ENGINEERING

(Answer ALL questions)

56. The principle of transmissibility of forces states that, when a force acts upon a body, its effect is
    a. Same at every point on its line of action
    b. Different at different points on its line of action
    c. Minimum, if it acts at the centre of gravity of the body
    d. Maximum, if it acts at the centre of gravity of the body

57. When a particle moves with a uniform velocity along a circular path, then the particle has ——————— acceleration.

    a. Tangential
    b. Centripetal
    c. Linear
    d. Traverse

58. In a reciprocating engine, which of the following forms a kinematic link?
    a. Cylinder and piston
    b. Piston rod and connecting rod
    c. Crankshaft and flywheel
    d. Flywheel and engine frame

59. For high-speed engines, the cam follower should move with
    a. Uniform velocity
    b. Simple harmonic motion
    c. Uniform acceleration and retardation
    d. Cycloidal motion

60. The pressure angle of a cam is the angle between the direction of the follower motion and a normal to the
    a. Pitch circle
    b. Base circle
    c. Pitch curve
    d. Prime circle

61. The balancing of a rigid rotor can be achieved by appropriately placing the balancing masses in
    a. A single plane
    b. Two planes
    c. Three planes
    d. Four planes

62. Match list I with list II and select the correct answer using the code given

	List – I		List – II
A.	Simply supported beam	1.	More than two supports
B.	Fixed beam	2.	One roller and one hinged support
C.	Continuous beam	3.	One end fixed and one end is free
D.	Cantilever beam	4.	Two rigid supports

    Code :

	A	B	C	D
a.	2	4	1	3
b.	3	4	1	2
c.	2	4	3	1
d.	1	2	3	4

63. The validity of torsion formula for pure torsion indicates that the shaft is subjected to
    a. Bending stress only
    b. Shear stress only
    c. Axial stress only
    d. Bending stress and shear stress only

64. A bar of diameter 30mm is subjected to a tensile load such that the measured extension on a gauge length of 200mm is 0.09mm and the change in diameter is 0.0045m, then the Poisson's ratio will be

    a. 1 / 2
    b. 1 / 3
    c. 1 / 4
    d. 1 / 5

65. Match list I with list II and select the correct answer using the code given

	List – I		List – II (Description)
A.	Single plate friction clutch	1.	Scooters
B.	Multi plate friction clutch	2.	Rolling mill
C.	Centrifugal clutch	3.	Trucks
D.	Jaw clutch	4.	Mopeds

Code :

	A	B	C	D
a.	1	3	4	2
b.	1	3	2	4
c.	3	1	2	4
d.	3	1	4	2

66. Match list I with list II and select the correct answer using the code given

	List – I		List – II (Description)
A.	Interference	1.	Arc of approach, arc of recess, circular pitch
B.	Dynamics load on tooth	2.	Lewis equation
C.	Static load	3.	Minimum number of teeth on pinion
D.	Contact ratio	4.	In accuracies in tooth profiles

Code :

	A	B	C	D
a.	3	4	1	2
b.	3	4	2	1
c.	1	2	3	4
d.	4	3	2	1

67. In the assembly of pulley, key and shaft
   a. Pulley is made the weakest
   b. Shaft is made the weakest
   c. Key is made the weakest
   d. All the three are designed for equal strength

68. Consider the following statements:
   i. A quasi-static process is a succession of equilibrium states
   ii. Infinite slowness is the characteristic feature of a quasi-static process
   iii. Pure substance consists of a single phase
   iv. Atmospheric air is the example of pure substance
   Of these statements
   a. i and iii are true
   b. i and ii are true
   c. ii and iv are true
   d. i, ii, iii and iv are true

69. A Rankine cycle consists of
   a. One isobaric, one isochoric and two adiabatic processes
   b. Two isobaric and two adiabatic processes
   c. Two isobaric and two isothermal processes
   d. Two isobaric and two isochoric processes

70. For the same compression ratio and heat release rate, what is the order of efficiency of Otto, Diesel and Dual cycle?
   a. $\eta_{otto} > \eta_{diesel} > \eta_{dual}$
   b. $\eta_{otto} > \eta_{dual} > \eta_{diesel}$
   c. $\eta_{dual} > \eta_{otto} > \eta_{diesel}$
   d. $\eta_{diesel} > \eta_{dual} > \eta_{otto}$

71. Dryness fraction is expressed as (mv and ml are masses of vapour and liquid respectively)
   a. $mv/(mv + ml)$
   b. $ml/(mv + ml)$
   c. $(mv + ml)/mv$
   d. $mv/(mv - ml)$

72. Heat addition to water in a boiler in Rankine cycle takes place at constant
    a. Entrophy
    b. Enthalpy
    c. Pressure
    d. Volume

73. Which of the following statements is correct?
    a. Gases show ideal gas behavior at very low pressure
    b. Zeroth law of thermodynamics is the basis of entropy measurement
    c. Specific heat has SI units of kJ/K
    d. Pressure is a microscopic quantity

74. A pattern is made up of the following materials
    i. Wood
    ii. Plastics
    iii. Metal
    a. i and ii only
    b. i and iii only
    c. ii and iii only
    d. i, ii, iii

75. Consider the following statements with respect to a lathe
    i. A headstock contains a hollow spindle and a motion control unit containing of transmission gears
    ii. The tool post is mounted on a compound rest
    iii. Both workpiece and single point cutting tool will be rotating
    iv. A lead screw is used for thread cutting
    a. i, ii and iii only
    b. i, ii and iv only
    c. i, iii and iv only
    d. ii, iii and iv only

76. Which of the following operations is an example of orthogonal cutting?
    a. Shaping
    b. Drilling
    c. Milling
    d. Turning

77. Which one of the following welding method is not a fusion process?
    a. Resistance welding
    b. Gas welding
    c. Arc welding
    d. Thermit welding

78. Which one of the following methods requires vacuum?
    a. LASER beam machining (LBM)
    b. Electron beam machining (EBM)
    c. Electric discharge machining (EDM)
    d. Electro chemical machining (ECM)

79. Match list I with list II and select the correct answer using the code given

List – I		List – II
A. Rolling	1.	Discrete parts
B. Forging	2.	Rod and wire
C. Extrusion	3.	Flat plates and sheets
D. Drawing	4.	Solid and hollow parts

Code :

	A	B	C	D
a.	3	1	4	2
b.	3	4	1	2
c.	1	4	3	2
d.	1	2	3	4

80. What is the fundamental equation for correct steering?
Where

C - Distance between pivot centres

B- Wheel base

θ - inner turning angle

ϕ -outer turning angle

a. $\cot \phi - \cot \theta = \dfrac{c}{b}$

b. $\cot \theta - \cot \phi = \dfrac{c}{b}$

c. $\cot \phi + \cot \theta = \dfrac{c}{b}$

d. $\cot \theta + \cot \phi = \dfrac{b}{c}$

81. The torque tube is a tubular member which encloses the
   a. Propeller shaft
   b. Half shafts
   c. Differential
   d. Axle

82. Which of the following works with the steering system to keep the wheels in correct alignment?
   a. Engine
   b. Suspension system
   c. Rear axle
   d. Tyre

83. In a half floating rear axle, the whole weight of the vehicle is first transmitted to
   a. Axle case
   b. Suspension spring
   c. Rear axle
   d. Front axle

84. To take care of the difference in the driving angle as rear axle moves up and down, the propeller shaft has one or more
   a. Slip joint
   b. Elbow joint
   c. Release joint
   d. Universal joints

85. Based upon power flow, the two basic type of axles are
   a. Dead and floating
   b. Dead and live
   c. Floating and semi floating
   d. Live and floating

86. Cushion springs in a clutch plate is meant to
   a. reduce torsional vibration
   b. reduce the shock of engagement
   c. synchronize the speed of the driving and driver plates
   d. avoid slippage

87. Wilson gear box is combination of
   a. Sliding gear box
   b. Helical gears
   c. Bevel gears
   d. Epicycle gear box

88. Which one of the following flows of fluid coupling is maximum when the slip is 100%?
   a. Vortex
   b. Rotary
   c. Turbulence
   d. Laminar

89. Stall torque ratio of three element torque converter is in the region of
   a. 3:1
   b. 2:1
   c. 4:1
   d. 5:1

90. Main advantage of electric vehicle is
   a. Zero emission
   b. High cost of battery
   c. Less vehicle weight
   d. Charging time

NG 23 (GROUP B)

91. Which of the following is composed of two rigid sections connected by joint, with passenger accommodation spaces situated in each rigid section?
   a. Single ducker bus
   b. Double ducker bus
   c. Articulated bus
   d. Split level bus

92. Which one of the following detail optimizations increases the drag area?
   a. Increase in windshield angle
   b. Increase in c-pillar thickness
   c. Increase in roof camber
   d. Increase in backlight angle

93. What type of wind tunnel is used for full scaled car model testing?
   a. Sub-sonic
   b. Transonic
   c. Supersonic
   d. Hypersonic

94. The ratio of the maximum displacement of the forced vibration to the deflection due to the static force, is known as
   a. damping factor
   b. damping coefficient
   c. logarithmic decrement
   d. magnification factor

95. Which one of the following influence rolling resistances?
   a. density of air
   b. coefficient of drag
   c. vehicle speed
   d. coefficient of lift

96. Which of the following moments tends to rotate a road vehicle about its vertical axis?
   a. pitching
   b. rolling
   c. yawing
   d. up thrust

97. Modern Heavy Commercial Vehicle is built upon ————— chassis layout.
   a. Forward control
   b. Normal control
   c. Rearward control
   d. Reverse control

98. The electrolyte for a fully charged lead-acid battery has a relative density of approximately:
   a. 1.000
   b. 1.100
   c. 1.280
   d. 1.500

99. Sulphation in lead acid battery occurs due to
   a. Heavy Charging
   b. Fast Charging
   c. Trickle Charging
   d. Incomplete Charging

100. Which among the distributorless ignition system is false statement?
   a. more moving parts, therefore less friction and wear
   b. flexibility in mounting location
   c. less maintenance required
   d. Elimination of mechanical timing adjustments

101. What does an actuator do?
   a. It selects transmission gear ratio
   b. It measures some variable for an engine control system
   c. It is an output device for an engine control system
   d. It sends signal to the driver

102. Which system gives the technician access to the status of the various vehicle sub systems?
   a. Adaptive Cruise Control
   b. Electronic Brake Force Distribution
   c. Traction Control
   d. Onboard Diagnostics

103. In many electronic ignition system, _____ is used to trigger the ignition system.
   a. Crankshaft speed sensor
   b. Knock sensor
   c. Coolant sensor
   d. EGO sensor

104. Fuel spray impingement on surface walls causes ——————— emission
    a. Carbon mono oxide
    b. Unburned hydrocarbon
    c. Particulate matter
    d. Carbon di oxide

105. Which governs selection and optimization of many engine design variables in CI engines?
    a. PM- HC trade off
    b. NOx - PM trade off
    c. CO - PM trade off
    d. CO - HC trade off

106. What is applied to the ceramic substrate to make the surface porous in catalytic converter?
    a. Filler
    b. Washcoat
    c. Top Coat
    d. Synthanols

107. ARAI stands for
    a. Automotive Research Association of India
    b. Automotive Reservation Association of India
    c. Automobile Research Association of India
    d. Automation Research Association of India

108. Which of the following is used as an adsorbent in charcoal canister?
    a. SIC
    b. NiO
    c. Activated Carbon
    d. Austenite ferrite

109. EUDC stands for
    a. Extra urban driving cycle
    b. European Union driving cycle
    c. Extra universal driving cycle
    d. Ex- Union driving cycle

110. The oxygen content of Methanol by mass is
    a. 50%
    b. 25%
    c. 75%
    d. 35%

111. Thermal Dilution refers to
    a. Dilution of exhaust gas
    b. Dilution of engine coolant
    c. Catalytic reduction
    d. Exhaust Gas Recirculation

112. The reduced Nitric oxide emission in vegetable oil fuelled diesel engine is due to
    a. Increased ignition delay of the fuel to get ignited
    b. Improved atomization and vaporization of the fuel
    c. Slow combustion of the injected fuel
    d. Complete combustion of the fuel

113. The flammability limit of Hydrogen in air by volume is
    a. 5-55 %
    b. 3-35 %
    c. 4-75 %
    d. 3-25 %

114. Use of High-Octane fuels in CI engines have a tendency to produce
    a. Reduced Ignition Delay
    b. Increased diffusion combustion phase
    c. Extended late burning phase
    d. Knocking Combustion

115. The carbon to hydrogen ratio of natural gas is
    a. 1:4
    b. 1:2
    c. 1:1
    d. 1:6

———————————

NG 23 (GROUP B)

07 - AERONAUTICAL AND AEROSPACE ENGINEERING

(Answer ALL questions)

56. Consider a steel pipe vertically hanging from a fixed support. The mass per unit length of the pipe is m. What would be the shape of the axial force diagram for the given pipe?
    a.   a straight line
    b.   rectangular
    c.   triangular
    d.   parabolic

57. A statically indeterminate stepped bar is given in Figure 1. Which of the following equations are required in order to obtain support reactions and displacements?
    (i)   equation of *equilibrium* in the axial direction
    (ii)   the equation of *compatibility*
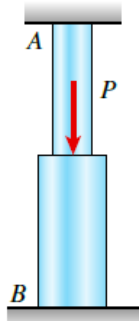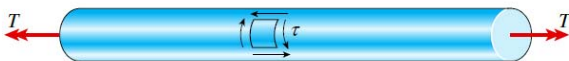   (iii) *force-displacement* relations

Figure 1

    a.   (i) alone
    b.   (i) and (ii)
    c.   (i) and (iii)
    d.   (i), (ii) and (iii)

58. A circular shaft is being subject to pure torsion. On a stress element on the surface of the shaft orientated at $45°$ to the shaft axis, the stresses acting would be

    a.   tensile and compressive
    b.   shear and tensile
    c.   shear and compressive
    d.   state of pure shear

59. Consider a bar of *solid circular cross-section* being subject to pure torsion of magnitude T. If the diameter of the bar is doubled, the maximum shear stress would be
    a.   reduced by a factor of two
    b.   reduced by a factor of four
    c.   reduced by a factor of eight
    d.   remain the same

60. A simply-supported beam of length L is subject to a linearly varying distributed load of intensity zero at the left end A of the beam and maximum intensity q_0 at the right end B. Find the support reaction at the right end B.
    a. $q_o L/2$
    b. $q_o L/3$
    c. $q_o L/4$
    d. $q_o L/6$

61. What would be the shape of the bending-moment diagram of a uniform cantilever beam of length L subjected to a tip concentrated moment M_o?
    a.   rectangular
    b.   trapezium
    c.   triangular
    d.   parabolic

62. Consider a uniform rectangular section wooden beam reinforced on the top surface with a metallic plate and subject to pure bending in the vertical plane. Which of the following statements would be true?
    (i)   Normal strains in the beam will vary linearly with distance from the neutral surface regardless of the shape of the stress-strain curve of the material.
    (ii) Normal strains in the beam will vary linearly with distance from the neutral surface only when material behaviour is linear.
    (iii) Normal stress variation will be parabolic.
    a.   (i)
    b.   (ii)
   c.   (i) and (iii)
    d.   (ii) and (iii)

63. A cylindrical pressure vessel has inner radius $r = 1.8$ m and wall thickness $t = 20$ mm. The material is steel with modulus $E = 200$ GPa and Poisson's ratio = 0.30. The internal pressure p is equal to 800 kPa. Calculate the circumferential strain at a point on the outer surface.
   a. 36×10^{-6}
   b. 72×10^{-2}
   c. 306×10^{-6}
   d. 720×10^{-3}

64. A simply-supported beam is loaded with a vertical load P at $x = a$ from the left end and another vertical load P (acting in the same direction as the first load) at $x = a$ from the right end. In the given beam, what are the stress resultants in the cross-section at $x = L/2$?
   a. bending moment
   b. shear force
   c. bending moment and shear force
   d. two normal stresses and one shear stress

65. A variation of normal stress across the depth of a cross-section is given below. What could the variation possibly represent?
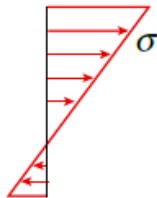
   a. normal stress variation in a beam of two materials subject to bending
   b. shear stress variation in a beam subject to pure bending
   c. normal stress variation when a cantilever beam is subject to eccentric axial load P
   d. shear stress variation in a beam subject to non-uniform bending

66. Identify the statements which are TRUE.
   (i)   maximum shear stress is equal to one-half the difference of the principal stresses
   (ii) shear stresses are zero on principal planes
   (iii) principal stresses always exist on mutually perpendicular planes
   a. (i) and (ii)
   b. (ii) and (iii)
   c. (iii) alone
   d. (i), (ii) and (iii)

67. The deflection of a simply-supported beam subject to uniformly distributed load acting throughout the beam length is considered. Maximum deflection would be proportional to
   (i)   applied load intensity
   (ii) the square of applied load intensity
   (iii) the square of beam length
   (iv) beam flexural rigidity
   a. (i) alone
   b. (ii) and (iii)
   c. (i) and (iv)
   d. (i), (iii) and (iv)

68. A simply-supported beam and a fixed-fixed beam of the same length are both subject to a transverse vertical force at mid-point. Which of the following statements are true?
   (i)   Shear force diagram for both beams are the same.
   (ii) Maximum bending moment is higher for the simply-supported beam.
   (iii) Maximum bending moment is higher for the fixed-fixed beam.
   (iv) For the fixed-fixed beam, bending moment is zero at beam mid-length ($x = L/2$).
   a. (iii)
   b. (i) and (ii)
   c. (i) and (iii)
   d. (ii) and (iv)

69. The number of independent elastic constant for a 3-D anisotropic material is
   a. 5
   b. 9
   c. 2
   d. 21

70. A closely-coiled helical spring is to carry a load of 500 N and the mean coil diameter must be 10 times that of the wire diameter. If the maximum shear stress in the wire material is not to exceed 80 MPa, find the required wire diameter.
   a. 8.4 mm
   b. 10.3 mm
   c. 12.6 mm
   d. 13.9 mm

71. In a closely-coiled helical spring having circular cross-section where applied axial load is W, the spring end deflection is
   (i)   proportional to W
   (ii) proportional to W^2
   (iii) proportional to number of coils
   (iv) inversely proportional to number of coils
   a. (i) and (iii)
   b. (i) and (iv)
   c. (ii) and (iii)
   d. (ii) and (iv)

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72. A common aluminium alloy used in aircraft construction, Al 7075-T6, has a tensile strength of approximately
    a. 220 MPa
    b. 570 MPa
    c. 43 GPa
    d. 72 GPa

73. A 3 m long steel bar (E = 200 GPa) has a square cross-section of 4 cm × 4 cm. Find the strain energy in the bar when it is subject to 128 kN axial force.
    a. 76.8 Nm
    b. 101 Nm
    c. 253.5 J
    d. 492.6 J

74. Piston rods, connecting rods and side links in a forging machine can fail by
    a. pure bending
    b. pure compression
    c. combination of pure compression and buckling
    d. combination of bending and pure shear

75. In beam bending, the unit of beam curvature is
    a. m
    b. m^2
    c. m^{-2}
    d. m^{-1}

76. The physical principle used for the derivation of energy equation is
    a. First law of thermodynamics
    b. Second law of thermodynamics
    c. Newton's second law
    d. Law of conservation of mass

77. Stream function for the doublet of strength μ is
    a. $-\dfrac{\mu}{2\pi}\dfrac{\cos\theta}{r}$
    b. $-\dfrac{\mu}{4\pi}\dfrac{\cos\theta}{r^2}$
    c. $-\dfrac{\mu}{2\pi}\dfrac{\sin\theta}{r}$
    d. $-\dfrac{\mu}{4\pi}\dfrac{\sin\theta}{r^2}$

78. For a positively cambered airfoil, if the angle of attack is increasing then the distance between the aerodynamic center and the center of pressure will be
    a. increasing up to wing stall
    b. remain same
    c. increasing
    d. decreasing

79. Consider a NACA 2412 airfoil of chord length 2.4 m. The location of maximum camber, measured from the trailing edge along the chord line is
    a. 1.44 m
    b. 1.55 m
    c. 1.66 m
    d. 1.77 m

80. According to Prandtl's lifting line theory, which of the following shape of the wing has minimum induced drag?
    a. straight rectangular
    b. elliptical
    c. straight tapered
    d. tapered sweptback

81. If the aspect ratio of a wing of finite span is increased, the lift curve slope will
    a. decrease
    b. increase
    c. remain same
    d. cannot say

82. For a finite wing, if the coefficient of lift is doubled while the aspect ratio is reduced to half then the induced drag will be
    a. doubled
    b. three times the original
    c. four times the original
    d. eight times the original

83. Panel methods are ideal for computing
    a. incompressible viscous flows
    b. compressible viscous flows
    c. compressible inviscid flows
    d. incompressible inviscid flows

84. Consider an airfoil system with N control points giving N equations for the N + 1 strengths. The final equation to solve this system is obtained by
    a. Kutta condition
    b. Helmholtz method
    c. Kelvin's circulation theorem
    d. The system can be solved without a final equation

85. In the flow of a calorically perfect gas, the static and stagnation temperatures are 260 K and 460 K, respectively. The Mach number for this flow is
    a. 1.66
    b. 1.76
    c. 1.86
    d. 1.96

86. Consider an isentropic flow at Mach 0.5 in a streamtube. Somewhere in the streamtube if the cross-sectional area is increased by 3% the change in flow density will be
    a. 1 %
    b. 2 %
    c. 3 %
    d. 4 %

87. In fluid flows, ratio of the surface tension force and the inertia force gives which of the following non dimensional number?
   a. Reynolds number
   b. Euler number
   c. Weber number
   d. Froude Number

88. In which of the following flow regime, the Hodograph transformation accurately solves the flow equations?
   a. subsonic flow
   b. transonic flow
   c. supersonic flow
   d. hypersonic flow

89. For an incompressible laminar flow over a flat plate, if the Reynolds number is 1000, the drag coefficient is
   a. 0.02
   b. 0.04
   c. 0.06
   d. 0.08

90. In supersonic wind tunnels, the oblique shock diffusers are preferred over normal shock diffusers because of
   a. lower thermal effects
   b. lower total pressure losses
   c. higher speed
   d. lesser number of shock waves

91. Which of the following is not a principle involved in shock–boundary layer interaction control?
   a. mass injection
   b. momentum re-energization
   c. localized boundary layer suction
   d. pre-heated walls

92. Schlieren system gives the _____ of the incident rays.
   a. Refractive index
   b. Displacement
   c. Optical changes
   d. Deflection angles

93. For an airplane to be statically stable, its centre of gravity must always be
   a. ahead of wing aerodynamic centre
   b. ahead of neutral point
   c. aft of the wing aerodynamic centre
   d. aft of neutral point

94. The instrument used for flow direction in the wind tunnel is
   a. Pitot tube
   b. Pitot Static tube
   c. Yaw head probe
   d. Anemometer

95. An airplane requires a longer ground roll to lift-off on hot summer days because
   a. the runway friction is high on hot summer days
   b. the thrust is directly proportional to free-stream density
   c. the thrust is directly proportional to weight of the aircraft
   d. the lift-off distance is directly proportional to free-stream density

96. Pressure ratio across the compressor is 1. Efficiency of the Braytons cycle in percentage is
   a. 100
   b. 20
   c. 50
   d. 0

97. An aircraft is moving with a velocity of 300 m/s and the exhaust velocity is the same as the aircraft speed. Propulsive efficiency in percentage is
   a. 100
   b. 50
   c. 30
   d. 0

98. Sutherland's formula related to
   a. Change in dynamic viscosity with temperature
   b. Change of density with temperature
   c. Change of kinematic viscosity with temperature
   d. Change of kinematic viscosity with density

99. Intake of a gas turbine engine is to
   a. Increase the static pressure of free stream air
   b. Increase the velocity of free stream air
   c. Increase the total pressure of free stream air
   d. Increase the total temperature of free stream air

100. Inlet buzz is related to
   a. Subsonic inlet
   b. Supersonic inlet
   c. Entry to the compressor
   d. Exit of the compressor

101. Which one of the engines takes relatively lower mass flow rate of air for producing thrust?
   a. Turboprop
   b. Turbojet
   c. Turbofan
   d. Both turboprop and turbofan

NG 23 (GROUP B)

102. Compressor of a gas turbine engine is
    a. to increase static pressure
    b. to increase total pressure
    c. to increase the static pressure and total pressure
    d. to decrease the total pressure

103. When the air passes through the impeller of a centrifugal compressor,
    a. Velocity of the air decrease and total pressure increases
    b. Velocity of the air increase and total pressure decreases
    c. Velocity and total pressure of the air increase
    d. No change in air velocity and total pressure

104. The value of slip factor is 1.0 when
    a. The blade tip speed is less than exit tangential velocity of the impeller
    b. The blade tip speed greater than the exit tangential velocity of the impeller
    c. The blade tip speed is equal to exit tangential velocity of the impeller
    d. Impeller tip velocity is zero

105. Which of the following components changes the direction of airflow in the centrifugal compressor?
    a. Collector
    b. Diffuser
    c. Impeller
    d. Both collector and diffuser

106. Pressure ratio range for axial flow compressor used in jet engines is
    a. 1-5
    b. 10-20
    c. 6-9
    d. 25-50

107. Air enters into the compressor axially and leaves axially in the axial flow compressor,
    a. tangential component at the entry and exit of the compressor are equal
    b. tangential component at the entry is less than that at the exit of the compressor
    c. tangential component at the entry is greater than that at the exit of the compressor
    d. both (b) and (c) are possible

108. Static pressure drop occurs only in the stator of a turbine whose degree of reaction is
    a. 1
    b. 0.5
    c. 0.75
    d. 0

109. Equal enthalpy drop occurs in the rotor and the stator of the turbine whose degree of reaction is
    a. 1
    b. 0.5
    c. 0.75
    d. 0

110. For a combustion process to be effective, entropy change should be
    a. zero
    b. small
    c. high
    d. negative

111. In a convergent-divergent nozzle flow, the mass flux is highest at
    a. Nozzle inlet
    b. Nozzle outlet
    c. 2/3rd of diverging length of the nozzle from throat
    d. Nozzle throat

112. A convergent nozzle delivers a flow at exit Mach number 1.0. The pressure ratio i.e stagnation pressure to static pressure ratio is
    a. 1.5
    b. 1.7
    c. 0.582
    d. 1.893

113. Effective cooling methods are introduced in turbine blade mainly
    a. to increase the maximum temperate limit
    b. to increase the thrust
    c. both (a) and (b)
    d. neither (a) nor (b)

114. In a convergent divergent nozzle, if you keep on reducing the back pressure, during the process
    a. Overexpansion occurs with no formation of normal shock at the exit
    b. Overexpansion occurs with the formation of normal shock at the exit
    c. No formation of normal shock at the throat before the start of overexpansion
    d. Expansion fan occurs before the formation of normal shock at the exit

115. When gas enters into the turbine and leaves, the tangential velocity of the gas
    a. Is constant along the radius
    b. Increases along the radius
    c. Decreases along the radius
    d. Initially decreases and then increases

_____

56. Grey pig iron is also known as
    a. Forge pig iron
    b. Mottled pig iron
    c. Foundry pig iron
    d. Bessemer pig

57. In mechanical treatment of steel the process of giving blows to a red hot metal with hammer is known as
    a. Forging
    b. Pressing
    c. Rolling
    d. Drawing

58. Potash lime glass is also known as
    a. Flint glass
    b. Bottle glass
    c. Bohemian glass
    d. Soft glass

59. Cuprous oxide imparts ———— colour to glass.
    a. Red
    b. Violet
    c. Yellow
    d. Blue

60. Which are used in plastic to separate the polymer chain by a great distance to make crystallization difficult?
    a. Pigments
    b. Hardeners
    c. Fillers
    d. Plasticizers

61. The process of direct transmission of heat through a material is known as
    a. Conduction
    b. Radiation
    c. Convection
    d. Evaporation

62. Which one among the choices given below is a semi rigid DPC material?
    a. Cement concrete
    b. Plastic sheet
    c. Stone
    d. Asphalt

63. For DPC at plinth level the grade of concrete used is
    a. M10
    b. M15
    c. M20
    d. M25

64. Thickened part of a flat slab over its supporting column, is technically known as
    a. Drop panel
    b. Column head
    c. Gusset plate
    d. Capital

65. Which of the following can be added to cement to delay its setting action?
    a. More water
    b. More sand
    c. More gypsum
    d. More Calcium carbonate

66. The strength of tensile members is not influenced by
    a. type of fabrication
    b. net area of cross section
    c. length of plate
    d. length of connection

67. Which one is not used as air entraining agents?
    a. Alumina
    b. Natural resins
    c. Fat
    d. Oil

NG 23 (GROUP B)

68. Which temple has an apsidal end ?
    a. Lad Khan temple, Aihole
    b. Durga Temple, Aihole
    c. Virupaksha temple, Aihole
    d. Mallikarjuna temple, Aihole

69. The stalactite vaulting in the mosque is called as
    a. Mihrab
    b. Dikka
    c. Muqurna
    d. Sahn

70. The council hall is called as
    a. Triclinium
    b. Tablinum
    c. Stoa
    d. Bouleuterion

71. 'Caulicoli' feature is found in
    a. Doric Capital
    b. Ionic Capital
    c. Corinthian capital
    d. Spires

72. A high raised platform reserved for the clergy in the church is
    a. Bema
    b. Chancel
    c. Apse
    d. Vestibule

73. Which of the following building has a sloped vaulted roof?
    a. Diwan – I – aam, Fatehpur Sikri fort
    b. Diwan – I – khas, Agra fort
    c. Diwan – I – khas, Lahore fort
    d. Diwan – I – aam, Red fort

74. Which vaulting is used in Henry VII Chapel, Westminster?
    a. Sexpartite
    b. Barrel
    c. Fan
    d. Quadripartite

75. Who designed the 'Walking city'?
    a. Warren Chalk
    b. Ebenezer Howard
    c. Michael Webb
    d. Ron Herron

76. The Jaipur column and the star atop in Rashtrapathi bhavan, New Delhi is made of ———— respectively.
    a. Concrete and Sandstone
    b. Sandstone and Glass
    c. Concrete and Granite
    d. Granite and Limestone

77. Which building won the aga khan award for architecture in 1996 - 1998 cycle?
    a. Vidhan Bhavan, Bhopal
    b. Capital Complex, Dhaka
    c. Amdavad ni Gufa, Ahmedabad
    d. Bahai Temple, New Delhi

78. Electronics corporation of India Ltd, Hyderabad is designed by
    a. Charles Correa
    b. B.V.Doshi
    c. Raj Rewal
    d. A. Kanvinde

79. Which of the following is an octagonal tomb made of tapering brick masonry walls?
    a. Sher shah Suri's tomb
    b. Iltumish's tomb
    c. Jehangir's tomb
    d. Rukh- E- alam's tomb

80. World's tallest building is
    a. Taipei 101, China
    b. Bhurj khalifa, Dubai
    c. Shanghai Tower, China
    d. One World Trade Center, USA

81. Belapur Housing,Navi Mumbai by Charles Correa is an example of
    a. Clustered organization
    b. Organic organization
    c. Radial organization
    d. Grid organization

82. Which one of the following architects is part of "Archigram Movement"
    a. Walter Gropius
    b. Peter Cook
    c. Christopher Alexander
    d. Peter Eisenmann

83. Which one of the following is an example for Post-Modern Architecture?
    a. Gustavo Capanema Palace
    b. Abbey Church
    c. Vanna Venturi House
    d. Hampton Court Palace

84. A Pattern language book provides
    a. 233 patterns
    b. 253 patterns
    c. 243 patterns
    d. 263 patterns

85. Parti diagram illustrates
    a. Abstract notions and contains scaled comparison of volumes
    b. Elements in relation to building form after the design is completed
    c. Sensorial or Experiential aspects of design concept
    d. Simple illustration debiting overall concept of design

86. In the field of digrammatic reasoning, "The Set and the Script in Architecture: The Manhattan Transcripts" is a theoretical visual work done by
    a. Cedric Price
    b. Peter Cook
    c. Bernard Tschumi
    d. Thomas Heatherwick

87. Which city is known as blue city of India?
    a. Jaipur
    b. Udaipur
    c. Jaisalmer
    d. Jodhpur

88. Shape grammar in architecture is a design process through
    a. Shapes and transformation
    b. Only forming initial shape
    c. Only subtraction
    d. Standardization of shapes

89. One of the fractal type, Seirpinski carpet starts with ————— basic shape.
    a. Dodecahedron
    b. Circle
    c. Square
    d. Equilateral triangle

90. The term "Fractal" is coined by
    a. Oscar Niemeyer
    b. Felix Hausdorff
    c. Helge Von Koch
    d. Benoit Mandelbrot

91. The example for Responsive facade is
    a. Al Bahar Towers,Abu Dhabhi
    b. Vitra Design Museum, Weil am Rhein, Germany
    c. Tel Aviv Museum of Art, Israel
    d. Kaohsiung Port terminal, Taiwan

92. The unit of illuminance is
    a. lumen
    b. lux
    c. foot candle
    d. percentage

93. For a three phase connection, the voltage for residential facilities would be,
    a. 240
    b. 415
    c. 230
    d. 400

94. Class B fire refers to fire caused by
    a. Solid materials
    b. flammable liquids and gases
    c. Appliances and electrical equipments
    d. Metallic substances.

NG 23 (GROUP B)

95. In dry riser system, the inner diameter of the pipe shall not be less than
    a. 50 mm
    b. 75 mm
    c. 100 mm
    d. 80 mm

96. In a transformer, efficiency is calculated as
    a. Output/input
    b. Input / output
    c. (Output /input)*100
    d. (Input / output) *100

97. Which refrigerant is banned in India?
    a. R22
    b. R410 A
    c. R290
    d. R32

98. The unit of color rendering index is indicated by
    a. percentage
    b. number
    c. mm
    d. cm

99. Humidification means
    a. Removal of water from air
    b. Greatest amount of water vapor contained in air
    c. Act of increasing moisture content in air
    d. Act of increasing temperature in air

100. In air conditioning systems, the following is considered to be most efficient
    a. VAV
    b. VRV
    c. CAV
    d. CVV

101. The distance between 2 lamp post is
    a. Less than 2 times the height of the pole
    b. 2.5 – 3 times the height of the pole
    c. More than 4 times the height of the pole
    d. Equal to the height of the pole

102. The luminous efficacy of LED lamps is
    a. 100 lm/W
    b. 150 lm/W
    c. 300 lm/W
    d. 220 lm/W

103. The maximum reverberation time in an unoccupied, furnished classroom with a volume under 10,000 cubic feet is
    a. 0.6 secs
    b. 1.5 –2 secs
    c. 2 -2.5 secs
    d. 3 secs

104. Duany Plater Zyberk formulated
    a. New urbanist neibourhood concept
    b. Incremental housing concept
    c. Energy efficient housing concept
    d. Self-sufficiency in housing

105. Transit oriented development was conceptualised by
    a. Manual Castells
    b. Peter Calthorpe
    c. Christopher Alexander
    d. Tony Garnier

106. As per Ministry of Housing and Urban Affairs, the bench mark for Urban water supply is
    a. 135 lpcd
    b. 165 lpcd
    c. 30 lpcd
    d. 65 lpcd

107. Per capita open space in Mumbai is
   a. 1.2 sq.m
   b. 10 sq.m
   c. 5 sq.m
   d. 2 sq.m

108. Space standards for residential local street as per UDPI guidelines is
   a. 20 to 30 m
   b. 10 to 20 m
   c. 30 to 30 m
   d. 6 to 10 m

109. Rental housing is an example for affordable housing at
   a. Belapur, Mumbai
   b. ZED homes, Bangalore
   c. Aarusha homes, Hyderabad
   d. Yerawada, Pune

110. Which of the following project land owners pooled their land and created township
   a. Bhardachalam township
   b. Margapatta township
   c. Hiranandini, Panvel
   d. Virar, Mumbai

111. Which of the following Architects is a pioneer in community participation and autonomy in housing design and construction?
   a. John F C Turner
   b. Vinod Gupta
   c. Shigeru Ban
   d. Tanmay Tathagat

112. Private sector participation is built into ———— scheme
   a. Valmiki-Ambedkar AWAS yojna
   b. PMAY
   c. Integrated housing and slum development programme
   d. Development scheme for small and medium towns

113. Which of the following Integrated townships is in Chennai
   a. Tata city
   b. Dwaraka
   c. SPR city
   d. Garodia nagar

114. Detrimental effects of open ground storey can be avoided by
   a. Partial height infill wall
   b. Introducing braced frames in the open storey
   c. Discontinuing RC wall in the ground floor
   d. Introducing offsets in the floors above

115. Which of the following organisations launched a programme on 10,000 housing units by 10 different teams in Navi Mumbai?
   a. HUDCO
   b. DDA
   c. CIDCO
   d. SPARCH

————————

PART III

09 – AGRICULTURAL AND IRRIGATION ENGINEERING

(Answer ALL questions)

56. The Gudgeon pin of an engine piston is made up of
    a. Bell metal
    b. Cast iron
    c. Aluminium alloy
    d. Case hardened steel

57. The speed range of a medium speed engine is
    a. Less than 350 rpm
    b. Between 350 and 1000 rpm
    c. Between 1001 and 1500 rpm
    d. More than 1501 rpm

58. The camshaft controls
    a. Valve Closing
    b. Valve Timing
    c. Valve Opening
    d. All of the above

59. Tilt angle of a standard disk plough varies from
    a. $15° – 25°$
    b. $25° – 35°$
    c. $35° – 40°$
    d. $40° – 45°$

60. An instrument used to measure soil compaction is
    a. Hydrometer
    b. Cone Penetrometer
    c. Tachometer
    d. Hygrometer

61. A ridger is used for
    a. Clod crushing
    b. Making channel
    c. Mulching
    d. Seed bed preparation

62. A man can develop
    a. 0.1 HP
    b. 0.5 HP
    c. 0.75 HP
    d. 1.0 HP

63. Medium size bullock can develop
    a. 0.50 to 0.75 HP
    b. 0.75 to 1.0 HP
    c. 1.0 HP to 1.25 HP
    d. 1.25 to 1.5 HP

64. The largest wind power plant in India is in the state of
    a. Tamil Nadu
    b. Rajasthan
    c. Gujarat
    d. Maharashtra

65. In two stroke cycle engine, one power stroke is obtained after every
    a. Half revolution of crankshaft
    b. One revolution of crankshaft
    c. Two revolution of crankshaft
    d. Three revolution of crankshaft

66. The carburetor of an engine is used to mix fuel with
    a. Air
    b. Water
    c. Oil
    d. None of the above

67. The cross sectional area of one cylinder of an engine multiplied by its stroke is
    a. Clearance volume
    b. Combustion volume
    c. Swept volume
    d. Piston volume

68. A power tiller operates most satisfactory with
    a.   Reaper
    b.   M B plough
    c.   Disc harrow
    d.   Rotary tillage tool

69. Function of transmission system is
    a.   To transmit the power from engine to rear wheel
    b.   To reduce the crankshaft speed to give desired speed
    c.   To transmit power through right angle
    d.   All of the above

70. Essential feature of good clutch is its
    a.   Ability to taking load without dragging and chattering
    b.   Capacity to transmit maximum load without slipping
    c.   High resistant to friction and easy control by hand or pedal lever
    d.   All of the above

71. Which among the following is an assumption of Hagen - Poiseuille equation?
    a.   Fluid is uniform
    b.   Fluid is laminar
    c.   Fluid is turbulent
    d.   Fluid is compressible

72. A rectangular pontoon is 5m long, 3m wide and 1.40m high. The depth of immersion of the pontoon is 0.60m in seawater. If the centre of gravity is 0.7m above the bottom of the pontoon, determine the metacentric height. The density for seawater = 1045 kg/m³.
    a.   0.850 m
    b.   0.543 m
    c.   1.350 m
    d.   0.271 m

73. The continuity equation is based on the principle of conservation of
    a.   mass
    b.   momentum
    c.   energy
    d.   force

74. The ratio of volume of pores to volume of solids is
    a.   Porosity
    b.   Void ratio
    c.   Particle density
    d.   None of the above

75. Water held by the force of surface tension is
    a.   Gravitational
    b.   Hygroscopic
    c.   Capillary
    d.   None of the above

76. Infiltration rate is generally lower in soils of
    a.   Heavy texture
    b.   Light texture
    c.   Medium texture
    d.   None of the above

77. Which of the following is a non-recording rain gauge?
    a.   Weighing type
    b.   Tipping Bucket
    c.   Simon's
    d.   Float type

78. Hydrograph is the graphical representation of
    a.   runoff and time
    b.   infilteration rate and time
    c.   groundwater flow and time
    d.   rainfall and time

79. Which one of the following is NOT a direct stream flow measurement technique?
    a.   Dilution method
    b.   Area-velocity method
    c.   Slope-area method
    d.   Ultrasonic method

NG 23 (GROUP B)

80. The length of a chain is measured from
   a. centre of one handle to centre of other handle
   b. outside of one handle to outside of other handle
   c. outside of one handle to inside of other handle
   d. inside of one handle to inside of other handle

81. The maximum tolerance in a 20m chain is
   a. 2 mm
   b. 3 mm
   c. 5 mm
   d. 8 mm

82. Which of the following methods of offsets involves less measurement on the ground?
   a. method of perpendicular offsets
   b. method of oblique offsets
   c. method of ties
   d. all involve equal measurement on the ground

83. The intensity of wind erosion is affected by
   a. Wind speed
   b. Soil particle size
   c. Soil structure
   d. All of the above

84. Contour farming is recommended for lands with slope range of
   a. 2 – 7%
   b. 12 – 24%
   c. 7 – 12%
   d. 0 – 5%

85. Universal Soil Loss Equation was developed by
   a. Wischmeier and Smith
   b. Muskingam
   c. Williams
   d. Horton and Strahler

86. Porosity is calculated by the formula
   a. 1 + (BD/PD)
   b. 1 + (PD/BD)
   c. 1 – (PD/BD)
   d. 1 – (BD/PD)

87. Which of the following crops is low sensitive to moisture stress?
   a. Citrus
   b. Maize
   c. Cotton
   d. Paddy

88. Based on loose chemical bonds what is the name of the part of field capacity water
   a. Hygroscopic water
   b. Gravity water
   c. Capillary water
   d. Residue water

89. What are the types of sediment load?
   a. Bedload and Suspended load
   b. Bedload and Dissolved load
   c. Bedload, Dissolved load and Suspended load
   d. Suspended load and Dissolved load

90. In no wind condition, the lateral spacing in a sprinkler system should be
   a. 100 m
   b. 65% of the wetted diameter
   c. 45% of the wetted diameter
   d. 125m

91. Who is the Father of modern drip irrigation?
   a. Simcha Blass
   b. Hazen Williams
   c. Darcy Wiesbach
   d. Bavarlal Jain

92. Modified Hooghoudt's equation for the computation of drain spacing is applicable to
   a. Homogeneous soils
   b. Anisotropic soils
   c. Heavy clay soils only
   d. Layered soils

93. The area of land draining into a watercourse at a given location is known as
    a. Catchment area
    b. Drainage area
    c. Drainage basin
    d. All of the above

94. Which type of following drains is used for small quantity of water removal?
    a. Blind inlet
    b. Shallow surface drains
    c. Deep surface drains
    d. Open drains

95. Field capacity of a ground aquifer equals
    a. specific yield
    b. 100 – specific yield
    c. 100/ specific yield
    d. specific yield / 100

96. Water wells excavated through confined aquifers are known as
    a. artesian wells
    b. non-artesian wells
    c. gravity wells
    d. water table wells

97. The line joining the static water levels in several wells excavated through a confined aquifer is known as the
    a. cone of depression
    b. piezometric surface
    c. perched water-table
    d. hypsometric curve

98. The volume of water discharged per unit time is
    a. Drawdown
    b. Well yield
    c. Specific capacity
    d. Hydraulic gradient

99. Specific yield is a property of
    a. Confined aquifer
    b. Semi-confined aquifer
    c. Unconfined aquifer
    d. All of the above

100. In forced air drying method, the moisture moves from
    a. Grain to air
    b. Centre to grain surface
    c. Air to grain
    d. All of the above

101. The recommended drying air temperature of a LSU dryer for raw paddy is about ——— °C
    a. 80
    b. 75
    c. 70
    d. 60

102. In a mixing type of columnar type continuous flow dryer, drying air temperature is
    a. 65°C
    b. 70°C
    c. 75°C
    d. 80°C

103. Statement 1 : Grinding laws are based on the energy required for creation of new surface area.
     Statement 2 : Leaching requires size reduction
    a. True, False
    b. True, True
    c. False, False
    d. False, True

104. Which of the following mechanical conveyors does not come under the division 'Carriers'?
    a. Belt conveyor
    b. Bucket elevator
    c. Screw conveyor
    d. None of the above

NG 23 (GROUP B)

105. Which of the following is the use of Centrifugal separation?
    a.   Clarification
    b.   Skimming
    c.   Bactofuge treatment
    d.   All of the above

106. What is the maximum storage period of food grains in rural godowns?
    a.   2 months
    b.   5 months
    c.   10 months
    d.   15 months.

107. As per NABARD's model scheme for setting up rural godowns, a capacity of medium type rural godown should be
    a.   50, 100 and 250 MT
    b.   500, 1000 and 2000 MT
    c.   2500, 2600 and 2800 MT
    d.   > 3500 MT

108. Safe storage moisture level of food grain crops is generally in the range of ————— for a safe storage period of 6 – 12 months.
    a.   4 to 6%
    b.   8 to 9%
    c.   10 to 12%
    d.   13 to 14%

109. Which of the following reactions commonly does not depend upon sunlight?
    a.   conversion from ergosterol to cholecalciferol
    b.   rancidity of oils
    c.   protein denaturation
    d.   chlorophyll degradation

110. Who is regarded as a Father of Canning?
    a.   Nicolas appert
    b.   Louis Pasteur
    c.   John Hall
    d.   Bryan Dokin

111. CIPHET is located in
    a.   Ludhiana
    b.   Bhopal
    c.   Trivandrum
    d.   Mysore

112. The farming management strategy based on observing, measuring and responding to temporal and special variability to improve agricultural production sustainability is called
    a.   Smart agriculture
    b.   Climate smart agriculture
    c.   Precision agriculture
    d.   Ultratech agriculture

113. Which resolution refers to the size of one pixel to the ground of the image acquired with a drone?
    a.   Spatial
    b.   Spectral
    c.   Temporal
    d.   None of the above

114. The full form of NWDPRA is
    a.   National Wasteland Development Project for Rainfed Areas
    b.   National Watershed Development Project for Rainfed Areas
    c.   National Watershed Development Project for Rural Areas
    d.   National Watershed Development Programme for Rainfed Areas

115. The cultivable command area of a medium irrigation project is
    a.   1000 – 2000 hectares
    b.   2000 – 10000 hectares
    c.   500 – 1000 hectares
    d.   10000 – 15000 hectares

————————

10 - BIO-TECHNOLOGY

(Answer ALL questions)

56. *B.subtlis* culture is inoculated with 1g of cells into 1 liter bioreactor containing 16 g/l of glucose. The specific growth rate during log phase is 0.693/h. The biomass yield from glucose is 0.5 g/g. After 3 hours, the amount of residual glucose concentration would be
    a.   8 g/l
    b.   4 g/l
    c.   2 g/l
    d.   1 g/l

57. In the presence of maintenance requirements, the biomass yield ($Y_{X/S}$)
    a.   increases with decline in specific growth rate
    b.   decreases with decline in specific growth rate
    c.   remains unchanged with decline in specific growth rate
    d.   initially increases and then decreases with decline in specific growth rate

58. The Effectiveness factor for diffusion controlled reaction in a porous catalyst
    a.   increases with increasing size of the catalyst
    b.   decreases with increasing size of the catalyst
    c.   is independent of the size of the catalyst
    d.   is independent of the Thiele modulus

59. Airlift reactor is suitable for
    a.   anaerobic process
    b.   for less viscous broth
    c.   for more viscous broth
    d.   aerobic process

60. A first order reaction requires two equal sized CSTR, the conversion is
    a.   less when they are connected in series
    b.   more when they are connected in series
    c.   more when they are connected in parallel
    d.   same whether they are connected in series or parallel

61. Anaerobic bio-reactor is 2m diameter. For efficient aeration depth recommended is
    a.   3m
    b.   1m
    c.   2m
    d.   4m

62. In ideal continuous flow stirred tank reactor, the composition of the exit stream
    a.   is same as that in the reactor
    b.   is less than that in the reactor
    c.   is more than in the reactor
    d.   cannot be predicted

63. If k is the rate constant, the half-life period of a first order reaction is given by
    a.   1.5k
    b.   2.5k
    c.   0.693/k
    d.   6.93k

64. The major advantage of steam sterilization over dry heat sterilization is that steam sterilization:
    a.   can be used for the sterilization of anhydrous materials
    b.   kills a greater spectrum of organisms
    c.   is not as destructive to materials
    d.   sterilizes in less time

65. Fed-batch process is a desirable mode of reactor operation is case of
    a.   substrate-inhibited growth
    b.   product-inhibited growth
    c.   shear-sensitive cultures
    d.   exo-polysaccharide production

66. Culture prepared by inoculating cells directly from the normal tissue of an organism to culture media is
    a.   Primary cells
    b.   Immortalized cells
    c.   Cell lines
    d.   Transformed cells

NG 23 (GROUP B)

67. Which one of the followings is not true about chloroplast and mitochondria?
    a. Both of them contain their own DNA
    b. Both of them contain circular DNA
    c. Both of them contain their own ribosome
    d. Both of them contain linear DNA

68. Microfilaments, intermediate filaments, and microtubules are collectively referred as
    a. Profilaments
    b. Cytoskeleton
    c. Lamins
    d. Cytokeratin

69. Large size molecules like hormones and cholesterol are taken up by the cells through the process of
    a. Active transport
    b. Facilitated diffusion
    c. Passive transport
    d. Endocytosis

70. Vesicles are made when part of the membrane pinches off from
    a. Nucleus
    b. Golgi Complex and ER
    c. Mitochondria
    d. Lysosome

71. For each ATP molecule hydrolysed by Na^+/K^+ ATPase
    a. $3Na^+$ are transported into the cell and $2K^+$ are transported out of the cell
    b. $3K^+$ are transported into the cell and $2Na^+$ are transported out of the cell
    c. $3Na^+$ are transported out of the cell and $2K^+$ are transported into the cell
    d. K^+ are transported out of the cell and $2Na^+$ are transported into cell

72. Phosphorylation of Retinoblastoma protein allows cell cycle to allow
    a. G1-S Transition
    b. G0-G1 Transition
    c. S-G2 Transition
    d. G2-M Transition

73. Fluidity of cell membrane is due to the presence of
    a. Hyaluronic acids
    b. Cholesterol
    c. Polysaccharides
    d. Peripheral proteins

74. The cell that expresses messenger molecule and also produces receptors for the same is
    a. Paracrine
    b. Heterocrine
    c. Autocrine
    d. Endocrine

75. The proteins which mediate precise fusion in vesicular transport in the cell are
    a. SNARE proteins
    b. Rab proteins
    c. Ras proteins
    d. Cdk proteins

76. CO_2 is primarily released from the following metabolic reaction
    a. Urea cycle
    b. TCA cycle
    c. Cori cycle
    d. Glycolysis

77. An apoenzyme is a
    a. Inactive Protein portion of an enzyme
    b. Non-protein component of enzyme
    c. Complete active enzyme with coenzyme
    d. Inactive enzyme with coenzyme

78. Which one of the following metabolic pathways converts lactate into glucose?
    a. Cori cycle
    b. TCA cycle
    c. Glyconeogenesis
    d. Glycogenolysis

79. Enzymes synthesised in various tissue that differ in amino acid sequence but catalyze the same biochemical reaction are called as
    a. Allosteric enzymes
    b. Abzymes
    c. Isomerase
    d. Isoenzymes

80. Which one of the following amino acid residues in the protein often gets phosphorylated?
    a. Alanine
    b. Tyrosine
    c. Glycine
    d. Histidine

81. The adherence of erythrocytes to viral proteins is called
    a. Hemadsorption
    b. Interference
    c. Expression
    d. Immunogenicity

82. The scientist who discovered aerobic nitrogen fixing bacteria
    a. Winogradsky
    b. Beijernick
    c. Behring
    d. Pasteur

83. The rare amino acid which is seen in the peptidoglycan cell wall is
    a. L alanine
    b. L glutamic acid
    c. D glutamic acid
    d. D leucine

84. Which one of the following is not a function of lipo polysaccharides (LPS)?
    a. LPS contributes to the negative charge of the bacterial cell surface
    b. LPS stabilize the outer membrane structure
    c. Lipid A portion entering the blood stream can cause septic shock
    d. LPS allows passage for the entry of antibiotics, bile salts, detergents etc.

85. Which one of the following has optimal growth at a water activity of less than 0.85?
    a. Xerophiles
    b. Osmotolerant
    c. Neutrophiles
    d. Psychrotolerant

86. Which technique cannot be used for the detection of a microdeletion in Y chromosome?
    a. Karyotyping
    b. PCR
    c. Microarray
    d. Hybridization

87. Which of the following is used as a rate enhancer in nucleic acid hybridization?
    a. Dried milk
    b. Heparin
    c. Dextran sulphate
    d. Urea

88. Which one of the following is not a thermostable enzyme?
    a. Taq polymerase
    b. DNA polymerase III
    c. Pfu Polymerase
    d. Vent polymerase

89. Which technique can be used to detect specific DNA sequence?
    a. Southern blotting
    b. Northern blotting
    c. Microarray
    d. RT-PCR

90. Which statement is correct for Amplified Fragment Length Polymorphism (AFLP)?
    a. PCR using a combination of random and gene specific primers
    b. PCR amplification followed by digestion with restriction enzymes
    c. DNA digestion with restriction enzymes followed by PCR with one primers
    d. DNA digestion using restriction enzymes followed by PCR with two primers

91. Which one of the following is not true about Yeast centromere plasmids (YCps)?
    a. Is a Low copy vector
    b. Replicates like they are independent chromosome
    c. Not stable without integration
    d. Contain ARS (Autonomous Replicating Sequence) with part of CEN (centromere sequence)

92. The second primer in 5' RACE is
    a. Internal primer
    b. Oligo dA sequence
    c. Adaptor oligo dT primer
    d. Oligo dT adaptor molecule

93. A student tried to clone two genes A and B independently for overexpression and purification in E. coli. Gene B could be cloned easily but all attempts to clone Gene A failed. However, Gene A could be cloned in the plasmid containing gene B. The statements given below were proposed to explain this result
    1. Protein coded by gene B is not lethal to the cell.
    2. Gene A has introns, which prevents its expression in E. coli
    3. Expression of the protein coded by A is lethal to the cell
    4. The B gene product inhibits the activity of A gene product.

    Which one of the following options gives the correct combination of statements to explain the observed result?

    a. 1 and 2
    b. 2, 3 and 4
    c. 1 and 4
    d. 1, 3 and 4

94. The Charon series belongs to a series of
    a. Genes
    b. Hosts
    c. Vectors
    d. Enzymes

95. Libraries containing a particular sequence present in one organism but absent in another organism are known as
    a. Normalized libraries
    b. Subtractive libraries
    c. Selective libraries
    d. Partial libraries

96. In fetus the lymphopoiesis occurs in
    a. Liver
    b. Bone marrow
    c. Spleen
    d. Thymus

97. Which one of the following is the co-receptor that is expressed by helper T cells?
    a. CD 8
    b. CD 4
    c. CD 40
    d. CD 80

98. The peroxidase positive granule of neutrophil is known as
    a. Primary granules
    b. Azurophilic granules
    c. Specific granules
    d. Secretary granules

99. Poly-Ig receptors which is present on the epithelial cells, transport and secrete
    a. Ig M
    b. Ig E
    c. Ig D
    d. Ig A

100. Asthma, Hay fever are due to
    a. Genetic disorder
    b. Deficiency disorder
    c. Type I hypersensitive reaction
    d. Type II hypersensitive reaction

101. Somatic hypermutation in the Ig polypeptide causes
    a. Gene Deletion in B-cell
    b. Translocation in B-cell
    c. Gene insertion in B-cell
    d. Point mutation in B-cell

102. Which one of the following binds with Killer-Immunoglobulin like receptors and are used by NK cell to recognize the target?
    a. MHC class I molecules
    b. MHC class II molecules
    c. HLA-DM molecules
    d. MHC I and MHC II

103. Which one of the following is the clinical marker of inflammation?
    a. Bilirubin
    b. C-Reactive Protein
    c. Ferritin
    d. Uric acid

104. Cellular activation of B-cells are triggered by the Co-stimulatory molecule
    a. CD 28
    b. CD 4
    c. CD 8
    d. CD 40

105. Lymphotoxin is also known as
    a. Interleukins
    b. Membrane proteins
    c. Tumor necrosis factor beta
    d. Haptens

106. An algorithm that examines every possible alternative to find one particular solution is known as
    a. Greedy algorithm
    b. Genetic algorithm
    c. Branch and Bound algorithm
    d. Exhaustive search algorithm

107. Statement I: The running time and Complexity of an algorithm is denoted by Big-O notation.
    Statement II: An Algorithm is recursive if it calls itself.
    Which one of the following is CORRECT with respect to the above two statements I and II?
    a. Statement (I) is true and (II) is false
    b. Statement (I) is false and (II) is true
    c. Both statements (I) and (II) are true
    d. Both statements (I) and (II) are false

108. The Edit distance between two sequences is the
    a. Number of matches between two sequences
    b. Number of mismatches between two sequences
    c. Maximum number of editing operations needed to transform one sequence into another sequence
    d. Minimum number of editing operations needed to transform one sequence into another sequence

109. In biological databases (I) GEO is a public functional genomics data repository. (II) UniProt is a nucleotide sequence database.
    Which one of the following is CORRECT with respect to the above two statements I and II?
    a. Both statements (I) and (II) are true
    b. Statement (I) is true and (II) is false
    c. Statement (I) is false and (II) is true
    d. Both statements (I) and (II) are false

110. BLOSUM62 substitution matrix is used for scoring
    a. Docking of protein-ligand complex
    b. Simulation of proteins
    c. Protein sequence alignments
    d. Searching of proteins

111. Smith-Waterman algorithm is used for
    a. Local alignment of sequences
    b. Global alignment of sequences
    c. Searching of sequences
    d. Minimal alignment of sequences

112. In evolution, if the same letter occurs in two aligned sequences, then that position is called as
    a. Protection
    b. Conservation
    c. Duplication
    d. Deviation

113. Which one of the following statements is NOT TRUE? An evolutionary tree is
    a. Composed of outer branches representing taxa
    b. Always a binary tree
    c. Composed of nodes and branches representing relationships among taxa
    d. Having more than one branch emanating from a node if the event separating taxa are so close.

114. A graph is called complete if there is an edge
    a. between any one pair of vertices
    b. between every pair of vertices
    c. only between first and last pair of vertices
    d. between any two pair of vertices

115. Which one of the following statements is NOT TRUE? Hidden Markov Model is
    a. Statistical model that considers all possible combinations of matches, mismatches and gaps to generate an alignment of a set of sequences
    b. Used to analyze sequence composition and patterns
    c. Used for protein structure predictions
   d. One where future states depend on past given the present

———————

11 - BIO-MEDICAL ENGINEERING

(Answer ALL questions)

56. Sodium and Potassium pumps are examples of
   a. Passive transport
   b. Active transport
   c. Osmosis
   d. Plasmolysis

57. Dendrites is a part of
   a. Nephron
   b. Neuron
   c. Red Blood cell
   d. Chondrocytes

58. The _____ is the resident cell type in articular cartilage.
   a. Chondrocytes
   b. Adipocytes
   c. Cardiomyocytes
   d. Myocytes

59. Which of the following cell organelles does not contain DNA?
   a. Nucleus
   b. Lysosomes
   c. Chloroplast
   d. Mitochondria

60. The chair conformation of sugar is found in
   a. D-glucopyranose
   b. Sugar with SH group
   c. Pyranose form
   d. D-galactopyranose

61. The blood glucose level cannot be augmented by muscle due to lack of
   a. Glucose -6-phosphate dehydrogenase
   b. Glucose-6-phosphatase
   c. Aldolase
   d. Phosphofructokinase

62. The most abundantly found enzyme in adipocytes is
   a. Cellulase
   b. Protease
   c. Amylase
   d. Lipase

63. Which of the following hormones increases the cholesterol synthesis by regulating HMG-CoA reductase?
   a. Insulin
   b. Glucagon
   c. Glucocorticoids
   d. Adrenaline

64. The current $i(t)$, through a 20Ω resistor in series with an inductance, is given by $i(t) = 4\sin(300t + 65°) + 4\sin(100t + 45°)$. Find the rms value of current.
   a. 4A
   b. 2A
   c. 15A
   d. 8A

65. If $i_1(t) = 20\cos(\omega t + 10°)$ and $i_2(t) = 10\cos(\omega t + 10°)$, which of the following statements is true?
   a. $i_1(t) = i_2(t)$
   b. $i_1(t)$ lags $i_2(t)$
   c. $i_1(t)$ leads $i_2(t)$
   d. $i_1(t)$ and $i_2(t)$ in-phase

66. Consider a DC voltage source connected to a series RC circuit. When the steady-state reaches, the ratio of the energy stored in the capacitor to the total energy supplied by the voltage source, is equal to
   a. 0.362
   b. 0.5
   c. 0.632
   d. 1

67. For a parallel RLC circuit, which of the following statements is not correct?
   a. The bandwidth of the circuit decreases if R is increased
   b. The bandwidth of the circuit remains same if L is increased
   c. At resonance, input impedance is a real quantity
   d. At resonance, the magnitude of input impedance attains its minimum value

68. For the depletion mode MOSFET amplifier shown in below Fig. V_{DS} (sat) that defines saturation region for MOSFET is given by
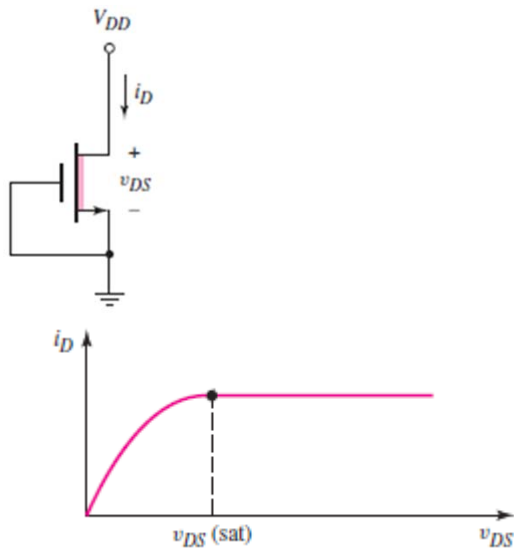
a. V_{DD}

b. $V_{DD}- V_{TN}$

c. V_{TN}

d. $-V_{TN}$

69. Assume transistor parameters of all transistors as $\beta = 100$ and $V_{BE} = 0.7V$ and transistors Q_1, Q_2 are operating in linear region. The current I_1 in the circuit shown below is
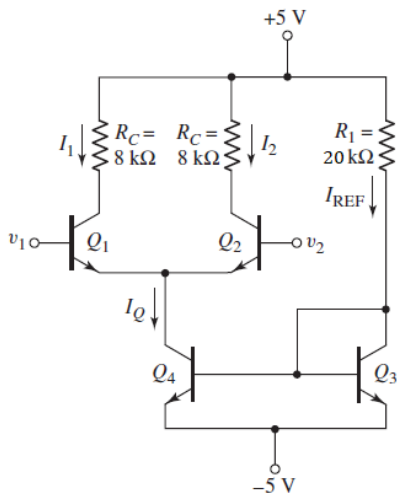
a. 0.23mA

b. 0.45mA

c. 0.5mA

d. 0.11mA

70. Consider the negative feedback system shown in the below Figure with the amplifier as a single pole system with 3dB frequency ω_0. The overall bandwidth of the negative feedback system is given by
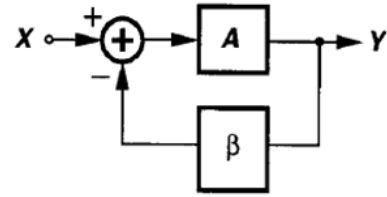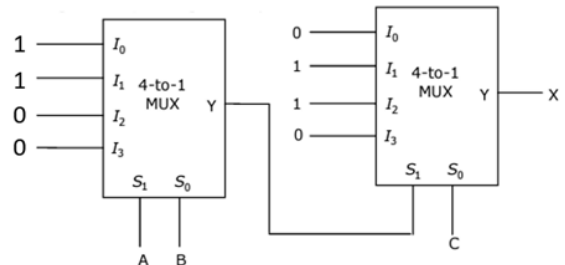

a. $\dfrac{\omega_0}{1 + A\beta}$

b. $\omega_0(1 + A\beta)$

c. $\dfrac{\omega_0}{\beta}$

d. $\omega_0\beta$

71. Consider a pn junction diode at $T = 300$ K in which $I_S = 10^{-15}$ A and $n = 1$. The diode current for $v_D = +0.70$ V is given by
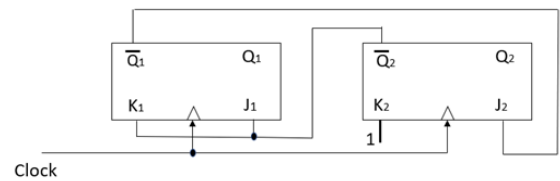
a. 0.49mA

b. 0.35mA

c. 1.22mA

d. 0.05mA

72. In the following circuit, the boolean expression at X is

a. $X = \overline{A}\,\overline{B} + ABC$

b. $X = \overline{A}\overline{C} + AC$

c. $X = \overline{A}B + A\overline{C}$

d. $X = AB\overline{C} + \overline{A}\,\overline{B}C$

73. The states in the counter are

a. 00, 01, 10...

b. 00, 11, 01...

c. 00, 10, 11...

d. 00, 11, 10...

NG 23 (GROUP B)

74. In the figure below, assume $Q_1 = 0, Q_2 = 0, Q_3 = 0$ initially. The output sequence at Q_1 is
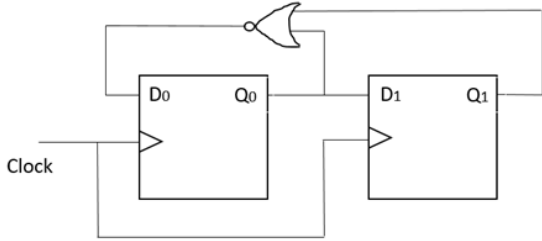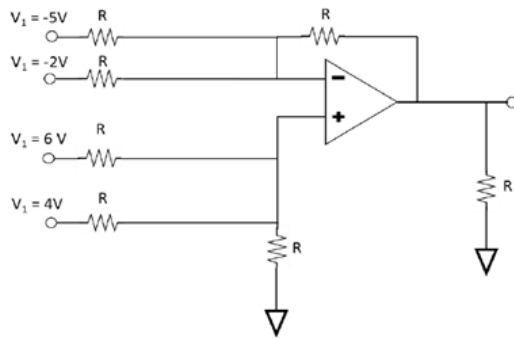

   a. 00,01,10,00,01…
   b. 00,01,10,11,00…
   c. 00,10,11,00,10…
   d. 00,01,11,00,01…

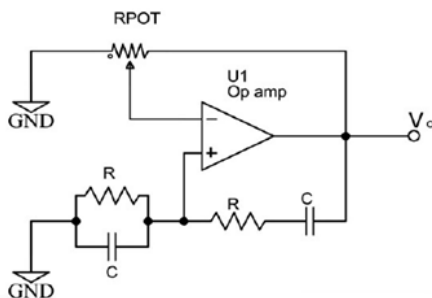75. The number of flipflops required in a Johnson ring counter to generate 8 states is
   a. 2
   b. 3
   c. 4
   d. 8

76. Output of the following Circuit is

   a. 17V
   b. 3V
   c. -5V
   d. -2V

77. The following Circuit is

   a. High pass filter
   b. RC Oscillator
   c. Wien Bridge Oscillator
   d. Low pass filter

78. Consider a 4-bit DAC. The analog value corresponding to digital signals of values 0000 and 0001 are 0 V and 0.25V, respectively. The analog value (in Volts) corresponding to the digitals signal 1111 is,
   a. 4.000
   b. 3.750
   c. 0.400
   d. 0.375

79. An input triangular wave of 2Vpp (peak to peak) is applied to a schmitt trigger circuit. What will be the output waveform, if the upper and lower threshold voltages are 0.25V?
   a. Square Waveform
   b. Pulse waveform
   c. Sawtooth waveform
   d. Sinusoidal waveform

80. In signed arithmetic in 8051, adding of two numbers 0C2H and 0AAH results in
   a. Carry flag will be set
   b. Carry flag will be reset
   c. Overflow flag will be cleared
   d. Overflow flag will also be set along with the carry flag

81. In 8051 microcontroller, the special function registers have address between
   a. 00H to 77H
   b. 40H to 80H
   c. 7FH to 80H
   d. 80H to FFH

82. Match the following for 8086 instruction set

A.	POP	1.	Bit manipulation instruction
B.	CMP	2.	Data transfer instruction
C.	JMP	3.	Arithmetic instruction
D.	SHL	4.	Unconditional branching instruction

   a. A-3,B-4,C-2,D-1
   b. A-2,B-3,C-4,D-1
   c. A-2,B-1,C-3,D-4
   d. A-2,B-3,C-1,D-4

83. Match the following

A.   TCON   1.   It is used to control 8051 microcontroller's power modes

B.   TMOD SFR   2.   It enables timer/counter and also consists of interrupt related bits

C.   PCON SFR   3.   It is used to configure serial port of 8051

D.   SCON SFR   4.   It is used to set the operating modes of TIMER 8051

    a.   A-1,B-4,C-3,D-2
    b.   A-2,B-4,C-1,D-3
    c.   A-4,B-2,C-1,D-3
    d.   A-3,B-1,C-2,D-4

84. Consider a finite duration signal which is non-zero in the range (-5,6) is convolved with another finite duration signal which is non-zero in the range (-3,9). The resultant signal is

    a.   an infinite duration signal and non-zero in the range (-∞, ∞)
    b.   a finite duration signal and non-zero in the range (-8,15)
    c.   a finite duration signal and non-zero in the range (-5,9)
    d.   an infinite duration signal and non-zero in the range (0, ∞)

85. Let a continuous time signal $x(t)$ has Laplace transform $X(s) = 1/(s+2)$, $\text{Re}\{s\} < -2$. If its Fourier transform is denoted as X(ω) then,

    a. $X(\omega) = 1/(\omega + 2)$
    b. $X(\omega) = 1/(j\omega + 2)$
    c. $X(\omega) = 1/(e^{j\omega} + 2)$
    d. $X(\omega)$ does not exist

86. Let a continuous time signal $x(t) = \cos(100\pi t)$ is sampled at a rate 400 samples per second. The 16 point DFT is performed with the samples to get $X(k)$. Then, $X(k)$ is non-zero for

    a. $k = 4$
    b. $k = 2, 4$
    c. $k = 2, 14$
    d.   none of the values of k

87. Consider a discrete time system is described by $y(n) + 2.5y(n-1) + y(n-2) = x(n)$. Select the right statement

    a.   It can be stable as well as causal
    b.   It can be causal but, not stable
    c.   It can be stable while it is anti-causal
    d.   It can be neither stable nor causal

88. Butterworth filter meets the desired frequency response specifications with _____ and _____ when compared to Chebyshev filter.

    a.   Low number of poles and wider transition band
    b.   High number of poles and smaller transition band
    c.   High number of poles and wider transition band
    d.   Equal number of poles and wider transition band

89. The order of FIR filter with smallest length for specifications given by pass band edge frequency of 200 Hz, stop band edge frequency of 250 Hz, sampling frequency of 1000 Hz and attenuation band ripple of 0.002 is

    a.   55
    b.   66
    c.   80
    d.   110

90. The symmetric impulse response of linear phase FIR filter designed as $h(n)$ = {–0.07, –0.16, –0.23, 0.75, 0.75, –0.23, –0.16, –0.07} is unsuitable for

    a.   Low pass filter
    b.   Band pass filter
    c.   Band reject filter
    d.   High pass filter

91. The maximum value of input to the FIR system whose output is limited to 1 and impulse response given by {1, 2, –3, 5, –3, 2, 1} is

    a.   1
    b.   0.4
    c.   0.2
    d.   0.6

92. A system has fourteen poles and two zeroes. Its high frequency asymptote, in its magnitude plot, has having a slope of
   a. -40 dB / decade
   b. -240 dB / decade
   c. -280 dB / decade
   d. -320 dB / decade

93. Consider the signal flow graph shown in Figure. The gain X_5/X_1 is
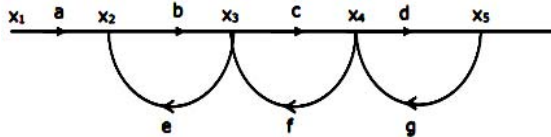
   a. $\dfrac{1-(be+cf+dg)}{abcd}$

   b. $\dfrac{bedg}{1-(be+cf+dg)}$

   c. $\dfrac{abcd}{a-(be+cf+dg)+bedg}$

   d. $\dfrac{a-(be+cf+dg)+bedg}{abcd}$

94. The system with open loop transfer function $G(s)H(s) = \dfrac{1}{s(s^2+s+1)}$ has a gain margin of
   a. -6 dB
   b. 3.5 dB
   c. 6 dB
   d. 0 dB

95. For a second order system, if the damping ratio lies between 0 to 1, the roots of the characteristics polynomials are
   a. Complex and conjugates
   b. Real and equal
   c. Real but not equal
   d. Imaginary

96. In a PCM system, if the number of bits change from 'n' to 'n-1', the noise power increases by
   a. 6 dB
   b. -6 dB
   c. 12 dB
   d. -12 dB

97. Consider that the modulation indices of AM and FM systems are 1 and β respectively. If the modulating signal is $m(t) = \cos \omega_m t$, the ratio of output SNR FM and AM systems is
   a. β
   b. 3β
   c. $3\beta^2$
   d. β^2

98. If the source emits 8 symbols with equal probabilities then the entropy of the source is
   a. 3
   b. 2
   c. 1
   d. 0

99. Determine the percentage of power carried by lower side band of AM signal with modulation index of 0.7
   a. 10
   b. 20
   c. 30
   d. 40

100. Which of the following transducers is used in Ultrasonic blood pressure monitor?
   a. Strain gauge
   b. Piezoresistive
   c. Piezoelectric
   d. Capacitive

101. Motion artifacts in ECG signal are eliminated by using
   a. Highpass filter with cutoff frequency 20 Hz
   b. Highpass filter with cutoff frequency 0.05 Hz
   c. Lowpass filter with cutoff frequency 20Hz
   d. Lowpass filter with cutoff frequency 0.05 Hz

102. Right leg driven circuit in a Bioamplifier is used to increase
   a. CMRR
   b. Gain
   c. Bandwidth
   d. Input impedance

103. In EEG signal, the power of alpha band is high in _____ lobe when the eyes are closed
   a. Frontal
   b. Temporal
   c. Parietal
   d. Occipital

104. When the pacemaker pulse has high energy and occurs during the vulnerable part of the T wave then the heart is in
   a. Normal state
   b. Atrial fibrillation
   c. Ventricular fibrillation
   d. Low pressure

105. In defibrillator, find the energy stored in a 16 μF capacitor that is charged to a potential of 5000V. To produce ventricular contraction with an electric pulse, the minimum energy required is
   a. 80 J
   b. 200 J
   c. 500 J
   d. 312 J

106. Intensity and time curve in normal muscle signifies chronaxie is
   a. Half the Rheobase
   b. Double the Rheobase
   c. Same as Rheobase
   d. Half the Chronaxie

107. What is the frequency range of the sound used for ultrasound diathermy?
   a. 0.75 – 1 MHz
   b. 0.1 – 0.75 MHz
   c. 3 – 5 MHz
   d. 5 –15 MHz

108. Identify the given visco elastic model
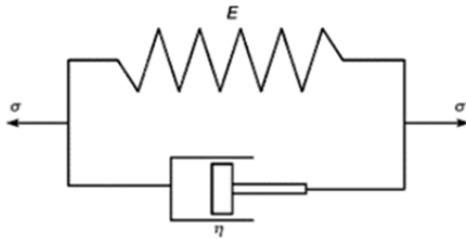
   a. Maxwell model
   b. Kelvin-Voigt model
   c. Burgers Model
   d. Standard linear solid

109. A brass specimen 10mm in diameter and a length of 50mm is loaded with 20KN force in tension. Calculate the stress experienced in the specimen. If the elastic modulus is 100GPa, calculate the strain.
   a. 230MN/m², 2300 µ strain
   b. 255KPa, 2.55 µ strain
   c. 230KN/m², 23 µ strain
   d. 255MPa, 2550 µ strain

110. The fluid has a density of 860kg/m³ and kinematic viscosity of 40mm²/sec. When the fluid flow inside a tube with the diameter 30mm with the velocity of 1.6 m/s, calculate the Reynolds number.
   a. 1200
   b. 830
   c. 400
   d. 2000

111. At the time of shock absorbent, the synovial fluid possess _____ type of fluid property.
   a. Pseudo plastic
   b. Thixotropic
   c. Dilatant
   d. Bingham Plastic

112. The advantage of Fourth generation CT is for
   a. Cardiac imaging
   b. Fast imaging
   c. Removal of Artifacts
   d. Multi slice imaging

113. Protons in different molecules differ in all of the following ways except
   a. Precession frequency
   b. T1
   c. T2
   d. Gyromagnetic ratio

114. In MRI, what is the frequency needed to excite spins in a xy-plane located at $z = -5.0$ cm. The resonance frequency at the isocenter is 63.85 MHz and the slice selection gradient is 1 G/cm.
   a. 63.829 MHz
   b. 63.289MHz
   c. 63.829 KHz
   d. 63.289KHz

115. In Gamma Camera, the Pulse height analyzer is used to
   a. Reject photons that have been Compton scattered
   b. Reject photons that have been absorbed
   c. Allow photons that have been Compton scattered
   d. Allow photons that have been scattered

NG 23 (GROUP B)

12 – CHEMICAL ENGINEERING

(Answer ALL questions)

56. For a mixing tank operating in the laminar regime, the power number varies with the Reynolds number (Re) as
  a. $Re^{-1/2}$
  b. $Re^{1/2}$
  c. Re
  d. Re^{-1}

57. The Prandtl number of a fluid is the ratio of
  a. Thermal diffusivity to momentum diffusivity
  b. Momentum diffusivity to thermal diffusivity
  c. Conductive resistance to convective resistance
  d. Thermal diffusivity to kinematic viscosity

58. For laminar flow of fluid through a packed bed, the valid equation is
  a. Hagen – Poiseuille equation
  b. Fanning equation
  c. Blake – Plummer equation
  d. Kozeny – Carman equation

59. A bed of spherical glass beads (density 3000 kg/m³, diameter 1 mm, bed porosity 0.5) is to be fluidised by a liquid of density 1000 kg/m³ and viscosity of 0.1 Pa.s. Assume that the Reynolds number based on the particle diameter is very small compared to one. If $g = 10$ m/s², then the minimum velocity (in m/s) required to fluidize the bed is
  a. 3.33×10^{-4}
  b. 3.33×10^{-1}
  c. 3
  d. 30

60. Glycerine ($\mu = 1.5$ Pa.s and $\rho = 1260$ kg/m³) flows at a velocity of 6.0 m/s in a 20 cm diameter pipe. The head loss in a length of 12 m of pipe will be
  a. 3 m
  b. 4 m
  c. 6 m
  d. 7 m

61. A generalised relation for crushing is $d(P/m) = -K \ (d \ D_s/D_s^{\ n})$. Solution of this equation leads to Rittingers law for 'n' equal to
  a. 1
  b. 2
  c. 3/2
  d. 5/2

62. Filtration operation when carried out by continuous increase of the inlet pressure of slurry is called as
  a. Constant rate filtration
  b. Varying pressure filtration
  c. Varying rate filtration
  d. Constant pressure filtration

63. The most suitable agitator for handling fibrous and dense slurries is
  a. Propeller agitator
  b. Cone type agitator
  c. Turbine agitator
  d. Radial propeller agitator

64. The critical speed (N_c) of a ball mill is equal to
  a. $(1/4\pi)(g/R_1 - R_2)^{1/2}$
  b. $(1/2\pi)(g/R_1 - R_2)^{1/2}$
  c. $(1/4\pi)(g/R_1 - R_2)^{-1/2}$
  d. $(1/2\pi)(g/R_1 - R_2)^{-1/2}$

65. Two solids of the same volume, one of steel and the other of stone, are immersed in water. Which one will suffer a greater loss of weight?

a. Steel

b. Stone

c. Equal for both

d. Depends on their mass

66. Match the process in Group I with the product in Group II

    Group – I   Group – II

P. DCDA process   1. Sodium hydroxide

Q. Mercury cell   2. Sulphuric acid

                     3. Sodium Carbonate

                     4. Nitric acid

a. P – 1, Q – 4

b. P – 1, Q – 3

c. P – 2, Q – 3

d. P – 2, Q – 1

67. Match the product in Group I with the raw material in Group II :

    Group – I   Group – II

P. Urea   1. Ammonia and carbon dioxide

Q. Polyester   2. Dimethyl terephthalate and ethylene glycol

                3. Ammonia and carbon monoxide

                4. Hexamethylenediamine and adipic acid

a. P – 1, Q – 4

b. P – 1, Q – 2

c. P – 2, Q – 3

d. P – 2, Q – 1

68. Match the product in Group I with the nature of reaction in Group II :

    Group – I   Group – II

P. Polyethylene 1. Condensation polymerisation

Q. Nylon   2. Addition polymerisation

R. Polystyrene

a. P– 1, Q – 1, R – 2

b. P – 1, Q – 2, R – 1

c. P – 2, Q – 2, R – 1

d. P – 2, Q – 1, R – 2

69. Match the process in Group I with the catalyst used in Group II :

    Group – I   Group – II

P. Sulphuric acid manufacture   1. Platinum

Q. Vegetable oil hydrogenation   2. Vanadium pentoxide

                3. Iron

                4. Nickel

a. P – 3, Q – 1

b. P – 2, Q – 2

c. P – 2, Q – 4

d. P – 4, Q – 2

70. If 90 g of iron react with sulphuric acid, how many litres of hydrogen are liberated at STP? (Atomic weight of Fe : 55.85)

a. 36.12 L

b. 0.0361L

c. 90L

d. 1.62L

NG 23 (GROUP B)

71. A gaseous reaction A→2B + C takes place isothermally in a constant pressure reactor. Starting with a gaseous mixture containing 50% A and the rest inert materials, the ratio of final to initial volume is found to be 1.8. The percent conversion of A is

    a. 80
    b. 50
    c. 60
    d. 70

72. A gas above its critical temperature can be condensed to the liquid state by

    a. Reducing the temperature at constant pressure
    b. Increasing the pressure at constant temperature
    c. By reducing the temperature at constant pressure or by increasing the pressure at constant temperature
    d. Cannot be condensed

73. A vessel of volume 1000 m³ contains air which is saturated with water vapour. The total pressure and temperature are 100 kPa and 293 K respectively. Assuming that the vapour pressure of water at 293 K is 2.34 kPa, the amount of water vapour in kilograms in the vessel is approximately

    a. 17
    b. 20
    c. 25
    d. 34

74. One mole of methane at 298 K undergoes complete combustion in a stoichiometric amount of air also at 298 K. Both the reactants and products are in the gas phase.

    $CH_4 + 2CO_2 \rightarrow CO_2 + 2H_2O$

    $\Delta H_{298}^0 = -730$ kJ/mol

    If the average specific heat of all the gases/vapours is 40 J/mol K, the maximum temperature rise (in K) of the exhaust gases would be approximately

    a. 1225
    b. 1335
    c. 1525
    d. 1735

75. Air enters an adiabatic compressor at 300 K. The exit temperature for a compression ratio of 3, assuming air to be an ideal gas (γ = C_p/C_v = 7/5) and the process to be reversible, is

    a. $300(3^{2/7})$
    b. $300(3^{3/5})$
    c. $300(3^{3/7})$
    d. $300(3^{5/7})$

76. A first order gaseous phase reaction is catalyzed by a non – porous solid. The kinetic rate constant and the external mass transfer coefficient are k and k_g respectively. The effective rate constant (k_{eff}) is given by

    a. $k_{eff} = k + k_g$
    b. $k_{eff} = (k + k_g)/2$
    c. $1/k_{eff} = (k\, k_g)^{1/2}$
    d. $1/k_{eff} = 1/k + 1/k_g$

77. For a packed bed reactor, the presence of a long tail in the residence time distribution curve is an indication of

    a. Ideal plug flow
    b. Bypass
    c. Dead zone
    d. Channelling

78. The following gas phase reaction takes place in a plug flow reactor.

    $$A + \tfrac{1}{2}B \rightarrow C$$

    A stoichiometric mixture of A and B at 300 K is fed to the reactor. At 1m along the length of the reactor, the temperature is 360 K. The pressure drop is negligible and an ideal gas behaviour can be assumed. Identify the correct expression relating the concentration of A at the inlet (C_{AO}) to the concentration of A at 1 m and the corresponding conversion of A (X)

    a. $C_A = 1.2\ C_{AO}\ (1 – X)/(1 – 0.33X)$
    b. $C_A = 1.2\ C_{AO}\ (1 – X)/(1 – 0.5X)$
    c. $C_A = 0.83\ C_{AO}\ (1 – X)/(1 – 0.33X)$
    d. $C_A = 0.83\ C_{AO}\ (1 – X)/(1 – 0.5X)$

79. For an isothermal second order aqueous phase reaction $A \rightarrow B$, the ratio of the time required for 90% conversion to the time required for 45% conversion is

a. 2
b. 4
c. 11
d. 22

80. An isothermal aqueous phase reversible reaction $P \longleftrightarrow R$ is to be carried out in a mixed flow reactor. The reaction rate in kmol/(m³h) is given by

$$r = 0.5\,C_p - 0.125\,C_R$$

A stream containing only P enters the reactor. The residence time required (in hours) for 40% conversion of P is

a. 0.8
b. 1.33
c. 1.6
d. 2.67

81. A pollutant P degrades according to first order kinetics. An aqueous stream containing P at 2 kmol/m³ and a volumetric flow rate of 1 m³/h requires a mixed flow reactor of volume V to bring down the pollutant level to 0.5 kmol/m³. The inlet concentration of the pollutant is now doubled and the volumetric flow rate is tripled. If the pollutant level is to be brought down to the same level of 0.5 kmol/m³, the volume of the mixed flow reactor should be increased by a factor of

a. 7
b. 6
c. 3
d. 7/3

82. What is the amount of work done by a compressor (kJ/kmol) to compress an ideal gas isothermally at a temperature of 25°C from 1 bar to 10 bars?

a. 5706
b. 3293
c. 57.07
d. 32.093

83. The internal energy of an ideal gas does not change in a reversible ——————— process.

a. Isothermal
b. Adiabatic
c. Isobaric
d. Isometric

84. A liquid mixture of benzene and toluene is in equilibrium with its vapour at 101.3 kPa and 373 K. The vapour pressures of benzene and toulene at 373 K are 156 and 63 kPa respectively. Assuming that the system obeys Raoults law, the mole fraction of benzene in the liquid phase is

a. 0.65
b. 0.41
c. 0.065
d. 0.04

85. For an air – water vapour mixture, the partial pressure of air is 6 Pa and the total pressure of system is 18 Pa. The mass absolute humidity is

a. 0.50
b. 0.31
c. 0.80
d. 0.62

86. The Henrys law constant of O_2 dissolved in water is 4.06×10^9 Pa at 293 K. Determine the solution concentration of oxygen in water which is exposed to dry air at 1.013×10^5 Pa and 293K?

a. $1.386 \times 10^{-3}\,M$
b. $8.54 \times 10^{-3}\ M$
c. $2.35 \times 10^{-3}\ M$
d. $4.39 \times 10^{-3}\ M$

87. Which of the following is a unit of fraction surface renewal rate?

a. cm/s
b. ft²/hr
c. 1/hr
d. ft²/s

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88. For the nth tray (counted from the bottom of a distillation column), the Murphree tray efficiency is given by
   a. $(Y_{n+1} - Y_n)/(Y_n^* - Y_{n-1})$
   b. $(Y_n - Y_{n-1})/(Y_n^* - Y_{n-1})$
   c. $(Y_{n-1} - Y_n)/(Y_{n+1} - Y_n)$
   d. $(Y_n^* - Y_{n-1})/(Y_n^* - Y_{n+1})$

89. In a single stage extraction process, 10 kg of pure solvent S (containing no solute A) is mixed with 30 kg of feed F containing A at a mass fraction X_F = 0.2. The mixture splits into the extract phase E and a raffinate phase R, containing A at X_E = 0.5 and X_R = 0.05 respectively. The total mass of the extract phase is (in kg)
   a. 6.89
   b. 8.89
   c. 10
   d. 8.25

90. The Lewis relation for air-water humidification is given by (k_γ: mass transfer coefficient of moisture in air; h_G : heat transfer coefficient; C_S : heat capacity of vapour – gas mixture)
   a. $h_G^2/k_\gamma C_S = 1$
   b. $k_\gamma C_S^2/h_G = 1$
   c. $h_G/k_\gamma C_S = 1$
   d. $k_\gamma^2 h_G/C_S = 1$

91. Which of the following surfaces has the least emissivity?
   a. Smooth glass
   b. Plaster
   c. Aluminum foil
   d. Concrete

92. The specific heat of concentrated orange juice is 5.8 kJ per kg°C. How much heat must be removed to cool 3 kg of juice from 30°C to 0°C?
   a. 24 kJ
   b. 38 kJ
   c. 522 kJ
   d. 600 kJ

93. In distillation column sizing calculation by short cut methods, match the following :
   P. Underwood's equation   1. Number of trays
   Q. Fenske's equation   2. Column diameter
   R. Gilliland's equation   3. Minimum number of ideal trays
   S. Vapour velocity at flooding   4. Actual number of trays
      5. Minimum reflux ratio
      6. Tray efficiency

   a. P-1, Q-3, R-4, S-6
   b. P-2, Q-5, R-1, S-3
   c. P-5, Q-3, R-6, S-2
   d. P-5, Q-3, R-4, S-2

94. A furnace is made of fire brick length L = 0.5 m, k = 0.7 w/mK. For the same heat loss and temperature drop, another material having k = 0.14 w/mK will have its thickness
   a. 0.05 m
   b. 0.1 m
   c. 0.2 m
   d. 0.5 m

95. Why fins are provided on a heat transfer surface?
   a. increase turbulence in flow for enhancing heat transfer
   b. increase temperature gradient to enhance heat transfer
   c. pressure drop of the fluid should be minimized
   d. surface area is maximum to promote the rate of heat transfer

NG 23 (GROUP B) 44

96. The unit step response of the transfer function $1/(s^2 + 2s + 3)$
    a. has a non zero slope at the origin
    b. has a damped oscillatory characteristic
    c. is overdamped
    d. is unstable

97. For feedback control system to be stable the
    a. Roots of the characteristic equation should be real
    b. Poles of the closed loop transfer function should lie in the left half of the complex plane
    c. Bode plots of the corresponding open loop transfer function should monotonically decrease
    d. Poles of the closed loop transfer function should lie in the right half of the complex plane

98. The time constant of a unity gain, first order plus time delay process is 5 min. If the phase lag at a frequency of 0.2 rad/min is 60°, then the dead time (in minutes) is
    a. $5\pi/12$
    b. $\pi/6$
    c. $\pi/12$
    d. $\pi/3$

99. An ideal PID controller has the transfer function $[1 + 1/(0.5s) + 0.2s]$. The frequency at which magnitude ratio of the controller is 1, is
    a. 0.5/0.2
    b. 0.2/0.5
    c. 0.2 × 0.5
    d. $1/(0.2 \times 0.5)^{1/2}$

100. A second order system can be obtained by connecting two first order systems $1/(\tau_1 s + 1)$ and $1/(\tau_2 s + 1)$ in series. The damping ratio of the resultant second order system for the case $\tau_1 \neq \tau_2$
    a. > 1
    b. = 1
    c. <1
    d. τ_2/τ_1

101. Under optimal condition, the number of arithmetic operations required for convergence using the SOR method varies with the number of equations, n, as
    a. $n^{5/4}$
    b. $n^{3/2}$
    c. $n^{7/4}$
    d. $n^{1/2}$

102. Runge-Kutta method is used to solve the —————— equation.
    a. Simultaneous equation
    b. Differential equation
    c. Linear equation
    d. Partial differential equation

103. The K-E model focusses on the mechanism that affects
    a. the turbulent kinetic energy
    b. the transport of scalar fluxes
    c. the Reynolds stresses
    d. the cross stresses

104. In a feed-back control system G and H denote open loop and closed loop transfer functions respectively. The output-input relationship is :
    a. G / (1 + H)
    b. H / (1 + G)
    c. G / H
    d. H / G

105. The open loop transfer function of a control system is KR/(1 + τs), This represents :
    a. a first order system
    b. dead time system
    c. a first order time lag
    d. a second order system

NG 23 (GROUP B)

106. A packed bed has a bulk density $\rho_b = 510\ Kg/m^3$ and the particles have a density $\rho_p = 770\ Kg/m^3$. The bed porosity
    a. 66%
    b. 51%
    c. 72%
    d. 34%

107. Adsorption capacity of a regenerated bed compared to the fresh bed is generally
    a. Slightly less
    b. Slightly more
    c. Half of that of fresh bed after the first regeneration
    d. Very low compared to fresh bed

108. How is the break through concentration defined for adsorption in a packed bed
    a. It is minimum detectable or maximum allowable concentration in the effluent from the bed
    b. It is approximately half of the solute concentration in the feed
    c. It is maximum solute concentration in the effluent
    d. It is the maximum solute concentration in the influent

109. The Entropy change for adsorption is
    a. Negative
    b. Zero
    c. Positive
    d. Unity

110. Metallic soap (eg. Aluminium or calcium salts of fatty acids) can be used
    a. As a lubricant
    b. As a rust preventive
    c. In hard water for cleaning clothes
    d. As a foam depressant in distillation column

111. Ringelmann chart is used to assess
    a. water pollution
    b. noise pollution
    c. air pollution
    d. radioactive pollution

112. The WHO classifies biomedical waste into
    a. 2 types
    b. 7 types
    c. 4 types
    d. 6 types

113. If the depth of partial flow in a sewer of diameter 2 m is 50 cm, its wetted perimeter will be
    a. $2\pi/3$
    b. $\pi/3$
    c. $\pi/2$
    d. π

114. The dilution ratio at which the odor is hardly detectable is generally called threshold odor number and for public supplies it should not exceed
    a. 5
    b. 7
    c. 3
    d. 9

115. To detect the turbidity of the order 0 to 1000 ppm the instrument used is
    a. Holmes Turbidimeter
    b. Jackson Turbidimeter
    c. Baylis Turbidimeter
    d. Hallige Turbidimeter

———————————

13 – CHEMISTRY

(Answer ALL questions)

56. Rate of diffusion of a gas is
    a. directly proportional to its density
    b. directly proportional to its molar mass
    c. directly proportional to the square root of its molar mass
    d. inversely proportional to the square root of both vapour density and molar mass

57. A real gas is expected to behave more or less ideally at
    a. low temperature and low pressure
    b. low temperature and high pressure
    c. high temperature and low pressure
    d. high temperature and high pressure

58. A gas undergoing expansion through a porus plug exhibits neither heating nor cooling if its temperature is equal to
    a. Boyle temperature
    b. Critical temperature
    c. Inversion temperature
    d. Consolute temperature

59. For a dilute solution, Raoult's law states that
    a. the lowering of vapour pressure is equal to the mole fraction of the solute
    b. the relative lowering of vapour pressure is equal to the mole fraction of solute
    c. the relative lowering of vapour pressure is proportional to the amount of solute in the solution
    d. the vapour pressure of the solution is equal to the mole fraction of solvent

60. A semipermeable membrane used in the measurement of osmotic pressure of a solution allows the passage of
    a. solvent molecules through it
    b. solute molecules through it
    c. both solvent and solute molecules through it
    d. either solvent or solute and not both through it

61. For an equilibrium reaction, an increase in temperature will
    a. increase the rate of the exothermic reaction more than that of the endothermic reaction
    b. increase the rate of the endothermic reaction more than that of the exothermic reaction
    c. increase both rates equally
    d. decreases both rates equally

62. The conjugate acid of NH_2^- is
    a. NH_3
    b. NH_2OH
    c. NH_4^+
    d. N_2H_4

63. An acidic buffer solution can be prepared by mixing the solutions of
    a. sodium acetate and acetic acid
    b. ammonium chloride and ammonium hydroxide
    c. sulphuric acid and sodium hydroxide
    d. sodium chloride and sodium hydroxide

64. For an acidic buffer solution, pH = pKa. It implies that
    a. [salt] = [acid]
    b. [salt] > [acid]
    c. [salt] < [acid]
    d. [salt] + [acid] is minimum

65. The unit of rate of a reaction is
    a. s^{-1}
    b. $mol\ s^{-1}$
    c. $mol\ L^{-1}\ S^{-1}$
    d. $mol^{-1}\ Ls^{-1}$

NG 23 (GROUP B)

66. For a First order reaction, the plot of log [A]$_t$ versus t is linear with a
   a. positive slope and zero intercept
   b. positive slope and nonzero intercept
   c. negative slope and zero intercept
   d. negative slope and nonzero intercept

67. The point at which all the three phases of a system exist is known as,
   a. Triple point
   b. Sublimation point
   c. Vapor point
   d. Eutectic point

68. The condense phase rule is given as
   a. $F = C - P + 2$
   b. $F = C - P + 1$
   c. $F = C + P - 2$
   d. $F = C + P - 1$

69. For single component system the number of phases for a single degree of freedom is,
   a. 0
   b. 2
   c. 1
   d. 3

70. Which of the following statements is true about Galvanic cell?
   a. Left electrode is cathode
   b. Right electrode is anode
   c. Left electrode is positive terminal
   d. Right electrode is positive terminal

71. The electric charge for electrode deposition of one gram equivalent of a substance is,
   a. One ampere per second
   b. 96500 coulombs per second
   c. One ampere for one hour
   d. Charge on one mole of electrons

72. Units of Faraday are,
   a. amperes
   b. C
   c. $C \, mol^{-1}$
   d. $C \sec^{-1}$

73. The negative catalyst retards the speed of a reaction because,
   a. it lowers the activation energy of the reaction
   b. it deactivates the reactant molecules
   c. it decreases the speed of reactant molecules
   d. it deactivates the product molecules

74. Which one of the statements is true?
   a. Catalyst changes equilibrium concentration
   b. A catalyst increases forward reaction and decreases backward reaction
   c. Composition of equilibrium mixture is not changed by the catalyst
   d. Pressure change does not change the equilibrium concentration

75. In solution, the hydrogen ion exists as,
   a. H^+
   b. either H^+ or H^-
   c. H^+ surrounded by water molecules
   d. H_3O^+

76. Which one of the following sets of quantum numbers represents an impossible arrangement?

	n	l	m_l	m_s
a.	3	2	-2	1/2
b.	4	0	0	1/2
c.	3	2	-3	1/2
d.	5	3	0	$-1/2$

77. The outermost electronic configuration of the most electronegative element is
   a. ns^2
   b. ns^2 np^4
   c. ns^2 np^5
   d. ns^2 np^6

78. Which one of the following isotopes is used in determination of the age of dead plants and animals?
   a. $_6C^{12}$
   b. $_6C^{13}$
   c. $_6C^{14}$
   d. $_1H^2$

79. The electronegativity of the following elements increases in the order
    a. C, N, Si, P
    b. N, Si, C, P
    c. P, Si, N, C
    d. Si, P, C, N

80. The first ionization potential of Na, Mg, Al and Si are in the order
    a. Na < Mg > Al < Si
    b. Na > Mg > Al > Si
    c. Na < Mg < Al > Si
    d. Na > Mg < Al > Si

81. Amongst the following elements, the one having the highest ionization energy is
    a. [Ne] $3s^2\ 3p^1$
    b. [Ne] $3s^2\ 3p^3$
    c. [Ne] $3s^2\ 3p^2$
    d. [Ne] $3d^{10}\ 4s^2\ 4p^3$

82. In the periodic table, electronegativity of elements
    a. decreases (i) from left to right across a period and (ii) on descending a group
    b. decreases from left to right across a period and increases descending a group
    c. increases from left to right across a period and decreases descending a group
    d. increases (i) from left to right across a period and (ii) on descending a group

83. The compound with no dipole moment is
    a. methyl chloride
    b. carbon tetrachloride
    c. methylene chloride
    d. chloroform

84. Which of the following molecules has a tetrahedral shape?
    a. $HgCl_2$
    b. CO_2
    c. NH_4^+
    d. $Ni(CN)_4^{2-}$

85. According to the VSPER theory, the molecule IF_5 has a shape of
    a. trigonal bipyramid
    b. tetrahedron
    c. pentagonal bipyramid
    d. octahedron

86. Mineral that does not contain Aluminium is
    a. Feldspar
    b. Fluorspar
    c. Cryolite
    d. Mica

87. The oxide of nitrogen isoelectronic with CO_2 is,
    a. NO
    b. N_2O_3
    c. NO_2^+
    d. N_2

88. The highest oxidation state of nitrogen is achieved in
    a. nitrogen dioxide
    b. dinitrogen trioxide
    c. dinitrogen tetroxide
    d. dinitrogen pentoxide

89. How many unit cells share a unit cell, in a face-centred cubic (fcc) lattice?
    a. 4
    b. 2
    c. 8
    d. 6

90. Which type of crystal is formed by a combination of a cation and anion?
    a. metallic
    b. ionic
    c. dipole-dipole
    d. covalent

91. Compound which obeys 18 electron rule is,
    a. $Mn(CO)_3$
    b. $Fe(CO)_4$
    c. $V(CO)_6$
    d. $Cr(CO)_6$

NG 23 (GROUP B)

92. Wilkinson's catalyst is,
    a. $(Ph_3P)_3RhCl$
    b. $(Ph_3P)RhCl$
    c. Ph_3P_3RhCl
    d. $(Ph_3P)_2RhCl_2$

93. Which of the following statements about Ferrocene is not true?
    a.   it obeys 18 e-rule
    b.   it is diamagnetic
    c.   it is an orange solid
    d.   it resists electrophilic reaction

94. The rate of radioactive disintegration follows
    a.   First order
    b.   Second order
    c.   Zero order
    d.   Third order

95. A process that produces a one unit increase in atomic number is,
    a. α emission
    b. β - emission
    c. γ ray
    d.   electron capture

96. The compound 2,3-dichlorobutane has
    a.   four stereoisomers
    b.   two pairs of enantiomers
    c.   one pair of enantiomers and one meso compound
    d.   one pair of enantiomers and two meso compounds

97. Which of the following orders of relative strength of acids is correct?
    a. $CH_3COOH > HCN > H_2O > H_2CO_3$
    b. $CH_3COOH < HCN < H_2O < H_2CO_3$
    c. $CH_3COOH > HCN < H_2O < H_2CO_3$
    d. $CH_3COOH < HCN < H_2O > H_2CO_3$

98. An electrophilic reagent must have
    a.   a vacant orbital
    b.   an orbital containing two electrons
    c.   an orbital containing one electron
    d.   all completely filled atomic orbitals

99. The major product obtained in the photobromination of 2-methylbutane is
    a.   1-bromo-2-methylbutane
    b.   1-bromo-3-methylbutane
    c.   2-bromo-3-methylbutane
    d.   2-bromo-2-methylbutane

100. Which of the following radicals has maximum stability?
    a. $3°$
    b. $2°$
    c.   vinly
    d.   benzyl

101. Anti-Markownikoff addition of HBr is not observed in
    a.   propene
    b.   butane
    c.   2-butene
    d.   2-pentene

102. The addition of HBr to an alkene in the presence of peroxide is an example of
    a.   electrophilic addition reaction
    b.   nucleophilic addition reaction
    c.   free radical addition reaction
    d.   the formation of carbanion as the intermediate

103. The treatment of propene with Cl_2 at $500 - 600\ °C$ produces
    a.   1,2-dichloropropane
    b.   allyl chloride
    c.   2,3-dichloropropene
    d.   1,3-dichloropropene

104. The compound that is most reactive towards electrophilic nitration is
    a. toluene
    b. benzene
    c. benzoicacid
    d. nitrobenzene

105. In aniline, the – NH₂ group,
    a. activates the benzene ring via both inductive and resonance effects
    b. deactivates the benzene ring via both inductive and resonance effects
    c. activates the benzene ring via resonance effect and deactivates it via inductive effect
    d. activates the benzene ring via inductive effect and deactivates it via resonance effect

106. The dehydration of 1-butanol gives
    a. 1-butene as the main product
    b. 2-butene as the main product
    c. equal amounts of 1-butene and 2-butene
    d. 2-methylpropene

107. The compound that gives a positive iodoform test is
    a. 1-pentanol
    b. 2-pentanone
    c. 3-pentanone
    d. pentanal

108. The dihedral angle between C-H in a staggered form of ethane is,
    a. 240°
    b. 180°
    c. 120°
    d. 60°

109. The most stable conformation of ethylene glycol is,
    a. anti
    b. gauche
    c. partially eclipsed
    d. fully eclipsed

110. For which of the following compounds enantiomer is not possible?
    a. phenyl ethane
    b. α-hydroxy propionic acid
    c. 2-amino pentane
    d. 1-chloro-1-phynylethane

111. The thermal ring opening reactions of cyclobutenes are,
    a. conrotatory
    b. disrotatory
    c. conrotatory or disrotatory depending on the temperature
    d. both conrotatory and disrotatory

112. Cope rearrangement is,
    a. [2,3] sigmatropic rearrangement
    b. [3,2] sigmatropic rearrangement
    c. [3,3] sigmatropic rearrangement
    d. [1,3] sigmatropic rearrangement

113. Which one of the following heterocyclic compounds is not aromatic?
    a. Pyridine
    b. Pyrrole
    c. Furan
    d. Piperidine

114. Pyridine has a delocalized π molecular orbital containing
    a. $4\pi e^-$
    b. $6\pi e^-$
    c. $8\pi e^-$
    d. $12\pi e^-$

115. Pyrrole is less basic than pyridine because the one pair of e- on N-atom in pyrrole,
    a. is part of the delocalized π molecular orbital
    b. is not part of the delocalized π molecular orbital
    c. resides in sp² hybrid orbital
    d. resides in sp hybrid orbital

————————

56. The stress developed in the top layers of the rocks which disintegrate due to repeated variations in temperatures is

    a. Tensile stress
    b. Compressive stress
    c. Shear stress
    d. Bending stress

57. Identify the pair mismatched.

    a. Cold and humid – Both mechanical and chemical weathering
    b. Dry and cold – Neither of them
    c. Hot and humid – Mechanical weathering is predominant
    d. Hot and dry – Mechanical weathering is predominant

58. The particle size in a Loess is around

    a. 2-3 mm in diameter
    b. 1-2 mm in diameter
    c. 0.01-0.05 mm in diameter
    d. 0.1-1 mm in diameter

59. The type of valley formed when the incision and denudation are approximately equal

    a. Saw cut valleys
    b. V-shaped valleys
    c. Flat-floored valleys
    d. Glacial valleys

60. What is the principal method of stream erosion and involves wearing away of the bedrocks?

    a. Hydraulic action
    b. Abrasion
    c. Attrition
    d. Corrosion

61. The condition not favouring the formation of delta is

    a. Absence of strong sea currents
    b. Presence of good quality of load
    c. Slope of seashore where the stream enters must be gentle
    d. Presence of strong sea currents

62. What type of drainage pattern would you expect to find on a volcano?

    a. dendritic
    b. rectangular
    c. radial
    d. radical

63. The intermittent jumping motion of sand grains along a river bottom is called

    a. saltation
    b. rippling
    c. suspension
    d. meandering

64. The chemical reaction: $2Fe_2SiO_4 + 4H_2O + O_2 = 2Fe_2O_3 + 2H_4SiO_4$ is an example of:

    a. Dissolution
    b. Hydration
   c. Reduction
    d. Oxidation

65.

This pattern most closely resembles ——————— drainage

    a. Dendritic
    b. Rectangular
    c. Radial
    d. Trellis

66. Which of the following is not related to wind erosion?

a. loess
b. ventifact
c. deflation
d. blowout

67. New seafloor is created at a

a. deep sea trench
b. mid-ocean ridge
c. subduction zone
d. transform fault

68. The type of mineral showing variable colour is?

a. Idiochromatic
b. Allochromatic
c. Iridescence
d. Pseudochromatic

69. Hardness of a mineral depends upon

a. Chemical composition
b. Atomic constitution
c. Chemical composition and atomic constitution
d. Physical makeup

70. The density range lies between 2.5 and 4.5 g/cc for

a. Metallic minerals
b. Non-metallic minerals
c. Metalloid minerals
d. Ore minerals

71. The smallest division of geological time scale is:

a. Eon
b. Era
c. Period
d. Epoch

72. A disconformity is

a. a rock unit that does not contain fossils
b. an erosional surface between igneous and metamorphic rocks
c. an erosional surface between horizontal sedimentary rocks
d. an erosional surface between different rock types

73. Match the followings:

Type of preservation		Changes occurs	
A.	Recrystallization	1.	Substitution of original skeletal material by a secondary mineral
B.	Permineralization	2.	Change in crystal structure
C.	Replacement	3.	Organism is preserved as a residual
D.	Carbonization	4.	Occurs in porous tissue

Code :

	A	B	C	D
a.	1	2	3	4
b.	2	4	1	3
c.	2	3	1	4
d.	1	3	2	4

74. The concordant bodies associated with structural basins are

a. Sills
b. Lopolith
c. Laccolith
d. Phacolith

75. The igneous rock with flow texture is

a. Gabbro
b. Pumice
c. Rhyolite
d. Basalt

76. Which of the following is finest grain sized?

a. Rudaceous rock
b. Arenaceous rock
c. Argillaceous rock
d. Psephite

NG 23 (GROUP B)

77. Identify the class to which the fold below belongs to
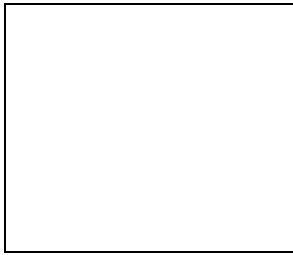
   a. Class 1
   b. Class 2
   c. Class 3
   d. Class 4

78. Which fault causes offset?

   a. Normal fault
   b. Reverse fault
   c. Oblique fault
   d. Dip fault

79. Joints traverse linear structure right angles in which type?

   a. Q joints
   b. S joints
   c. B joints
   d. T joints

80. Deposits that were formed subsequent to the formation of the host rocks are called

   a. Syngenetic
   b. Epigenetic
   c. Syncgenetic
   d. Sinclogenetic

81. When gravity is the agent of placing of deposit, the deposit is called

   a. Deluvial deposit
   b. Aeolian deposit
   c. Alluvial deposit
   d. Beach placers

82. Which of the following mineral deposit is formed exclusively by surface geological processes?

   a. Wollastonite
   b. Asbestos
   c. Corundum
   d. Bauxite

83. The following pathfinder element is useful in the exploration of Au

   a. Cu
   b. As
   c. Cr
   d. Ag

84. In geobotanical prospecting Lonicera-confusais used to indicate

   a. Nickel
   b. Arsenic
   c. Copper
   d. Silver

85. Polymetallic nodules are generally restricted to the

   a. Continental shelf
   b. Beach
   c. Deep ocean floor
   d. Marine subsoil

86. Placer deposits are formed by:

   a. Fluid boiling
   b. Magma segregation
   c. Gravitational separation
   d. Wall-rock alteration

87. Which of the following is a magnesium carbonate ore?

   a. Pyrite
   b. Malachite
   c. Rhodochrosite
   d. Pyrolusite

88. Malachite and Azurite are characteristics ore minerals of

   a. Gossan zone
   b. Zone of oxidation
   c. Zone of supergene enrichment
   d. Protore

89. Geiger Müller counter is commonly used for the exploration of:
    a. Bauxite deposit
    b. Pb-Zn deposit
    c. Uranium deposit
    d. Iron ore deposit

90. Supergene sulphides enrichment occurs:
    a. Above the water table
    b. A depth independent of water table
    c. Below the water table
    d. Both above and below the groundwater table

91. The bulk chemical composition of a rock during metamorphism:
    a. Decreases
    b. Increases
    c. Remain constant
    d. Uncertain

92. Remote sensing uses which of the following waves in its procedure?
    a. Electric field
    b. Sonar waves
    c. Gamma- rays
    d. Electro-magnetic waves

93. In visible region, the blue light is having a wave length range of
    a. 0.42-0.52 micrometer
    b. 0.24-0.52 micrometer
    c. 0.42-0.92 micrometer
    d. 0.22-0.32 micrometer

94. Polar orbiting satellites are generally placed at an altitude range of
    a. 7-15km
    b. 7000-15000km
    c. 700-1500km
    d. 70-150km

95. IRS P3 satellite uses which of the following sensors?
    a. PAN
    b. LISS-III
    c. MOS
    d. LISS-II

96. While mapping land use and land cover, which scale is recommended?
    a. 1: 25000
    b. 1: 50000
    c. 1: 250000
    d. 1: 25

97. Focal plane is provided at
    a. Point of resection
    b. Point of intersection
    c. Point of contraction
    d. Point of collimation

98. Which of the following types is remnant magnetism?
    a. Thermo-remnant
    b. Chemical remnant
    c. Detrital-remnant
    d. All of the above

99. The acceleration due to gravity 'g' is minimum at
    a. Subtropical region
    b. Tropical region
    c. Poles
    d. Equator

100. What is the process by which water enters the small pore spaces between particles in soil or rocks
    a. transpiration
    b. inflitration
    c. precipation
    d. sublimation

101. What is the term for a relatively impermeable geologic unit?
    a. an artesian
    b. an aquiclude
    c. an aquifer
    d. none of the above

102. With respect to the Earth's land surface, which of the following expressions is correct?
    a. precipitation = evaporation – runoff
    b. precipitation = runoff – evaporation
    c. precipitation = evaporation + runoff
    d. precipitation = evaporation * runoff

NG 23 (GROUP B)

103. Which of the following rocks has the highest permeability?

    a.   an unfractured shale
    b.   a cemented sandstones
    c.   an uncemented sandstone
    d.   all of these rocks have approximately the same permeability

104. Which type of compressive strength is taken as the most important index property of stones?

    a.   Confined
    b.   Drained
    c.   Undrained
    d.   Unconfined

105. Which rock possesses very high compressive strength?

    a.   Igneous
    b.   Sedimentary
    c.   Metamorphic
    d.   Sedimentary and metamorphic

106. The density of the rock with natural moisture content is

    a.   Dry density
    b.   Wet density
    c.   Bulk density
    d.   Natural density

107. The resistance offered by a stone against rubbing action is called

    a.   Rubbing resistance
    b.   Abrasive resistance
    c.   Frictional resistance
    d.   Shear resistance

108. In synclinal bends, dams placed on which part would run risk of leaking?

    a.   Upstream limb
    b.   Downstream limb
    c.   Core
    d.   Sloping side

109. Which type of geological structure can be rectified by grouting?

    a.   Joints
    b.   Folds
    c.   Faults
    d.   Inclined strata

110. Which of the following is not a desirable of a road stone?

    a.   Hydrophobic in nature
    b.   Sufficient hardness and toughness
    c.   Durability at the place of use
    d.   Hydrophilic in nature

111. Bodies of seawater of considerable volume moving along and parallel to the shore are called

    a.   Oscillatory waves
    b.   Translatory waves
    c.   Littoral currents
    d.   Lateral currents

112. The area between two breaker zones is called

    a.   surf
    b.   breaker
    c.   undertow
    d.   long shore

113. The movement of water to surface which is not only cold but also is nutrient rich is called

    a.   upwelling
    b.   surface current
    c.   nutrient water
    d.   surface water

114. Fresh water can be produced by removing the salt from ocean water using a process called

    a.   salt water cleanup
    b.   desalination
    c.   water purification
    d.   wastewater treatment

115. Average salinity of water of Arabian Sea is

    a.   55 ppt
    b.   45 ppt
    c.   25 ppt
    d.   35 ppt

15 – FOOD TECHNOLOGY

(Answer ALL questions)

56. Which one of the following is an essential amino acid?
    a. Serine
    b. Alanine
    c. Lysine
    d. Aspartic acid

57. The major difference between incomplete and complete protein is based on
    a. Digestibility
    b. Amino acid content
    c. Solubility
    d. Its structure

58. Recommended daily intake of iron for adult male is
    a. 4 mg
    b. 8 mg
    c. 70 mg
    d. 30 mg

59. Dietary deficiency manifestation of biotin results in
    a. Dermatitis
    b. Tetany
    c. Joint pain
    d. Anemia

60. Prebiotics are
    a. Source of food for the growth or activity of beneficial microorganisms
    b. Precursor of probiotics
    c. Mutants of probiotics
    d. Having similar activity of antibiotics

61. Which one of the following vitamins readily lost during drying of food?
    a. Vitamin D
    b. Vitamin C
    c. Vitamin B3
    d. Vitamin K

62. Caramelization and Maillard reactions are examples of
    a. Enzymatic browning
    b. Lipid peroxidation
    c. Non-enzymatic browning
    d. Browning of vegetables

63. The enzyme abundantly expressed during the ripening stage of fruit development is
    a. Hyaluranidase
    b. Polygalacturonase
    c. Polyphenol oxidase
    d. Papain

64. Resistant starch type-4 is
    a. Lipid bound starch
    b. Heat induced modified starch
    c. Hydrolysed starch
    d. Chemically modified starch

65. The ability of the fats to be spread and shaped is termed as
    a. Softening of fats
    b. Emulsification of fats
    c. Solid fats
    d. Plasticity of fats

66. Water content of food is measured by
    a. Formol titration
    b. Biuret test
    c. Karl Fischer titration
    d. Polarimetry

NG 23 (GROUP B)

67. Methyl anthranilate, used as flavoring agent to provide flavor of
   a. Grape
   b. Orange
   c. Butter
   d. Caramel

68. Mention the test organism of penicillin detection in milk
   a. *B. sterothermophilus* (ATCC 7953)
   b. *B. pumilus* (ATCC 27142)
   c. *B. subtilis* (ATCC 6633)
   d. *B. subtilusvarniger* (ATCC 9372)

69. SPS under WTO stands for
   a. Standards, prevention and specification
   b. Sanitary and phytosanitary measures
   c. Specifications for products and supplements
   d. Safety and prevention of sickness

70. ISO 19011: 2011 Quality management systems deals with
   a. Specifications with guidance for use
   b. Guidelines for performances improvements
   c. Customer's satisfaction
   d. Guidelines for quality and or environmental management system auditing

71. How many scientific panel have been constituted in Food Authority?
   a. 16
   b. 7
   c. 9
   d. 5

72. As per the definition for Food under the food act in India, Food does not include
   a. Alcoholic beverages
   b. Caffeinated beverages
   c. Chewing gums
   d. Chewing tobacco

73. Which of the following is said to be the "Doctor" of confectionary
   a. Invertase
   b. Mono sodium glutamate
   c. Sorbitol
   d. Aspartame

74. Dry storage means at a temperature about ——————— and humidity below —————.
   a. 20, 50-100%
   b. 20, 50%
   c. 100, 50-100%
   d. 100, 50%

75. What is the purpose of blanching (immersing food in hot water) vegetables during canning
   a. To soften products to feel better
   b. To denature enzyme that change colour, texture
   c. To reduce microbial population
   d. All of the above

76. NATO is produced from the fermentation of
   a. Milk
   b. Soybeans
   c. Cabbages
   d. Barley

77. Rapid heating of cream is accomplished by injecting steam or by a combination of steam injection and evacuation in a process known as
   a. Flash pasteurization
   b. Vat pasteurization
   c. Vacreation
   d. Aseptic packaging

78. The yellow colour in onion is due to the pigment of
   a. Lyconene
   b. Caraotene
   c. Quereitin
   d. Anthocyanin

79. Entamoebahistolytica is a parasite contaminant of food responsible for
    a. Bacterial dysentery
    b. Fungal dysentery
    c. Amoebic dysentery
    d. Histolic dysentery

80. Percentage of water in buffalo milk is:
    a. 65-67 %
    b. 70-75 %
    c. 80-85 %
    d. 89-92 %

81. Percentage of mineral matter in milk is about
    a. 1 %
    b. 0.7 %
    c. 1.5 %
    d. 0.05 %

82. Which of the following statements are correct?

    Statement 1 : Pulsed Electric field needs to follow by refrigeration storing to increase shelf life and prevent spoilage.

    Statement 2 : Structural changes at cell membrane and inactivation of enzymes, is how high hydrostatic pressure works for the food industry.

    a. True, False
    b. True, True
    c. False, False
    d. False, True

83. Which of the following combination of processing and preservation techniques works best for smoked products?
    a. Salt and acidification
    b. Heat and solid content
    c. Heat, salt, acidification/minimal moisture content
    d. Heat, salt, dipping in brine/minimal moisture content

84. XYZ Company takes its customer feedback very seriously. Hence when suggestions such as – food processed product should have minimum loss of actual flavour, no added colour etc., the company planned on shifting to the latest trend in the industry called
    a. Minimal Optimization
    b. Advanced refining
    c. Minimal processing
    d. All of the above

85. The fruit of rice and wheat is called
    a. Caryopsis
    b. Achene
    c. Siliqua
    d. Follicle

86. In climatic fruits during maturation
    a. Starch converted to sugars
    b. Starch accumulated
    c. Lipids accumulated
    d. Proteins converted to amino acids

87. Which of the following parameter does not change during ripening process of fruit ?
    a. Color
    b. Acidity
    c. Sugar content
    d. Oil content

88. Which of the following is NOT a step in Black tea manufacture?
    a. Drying/Firing
    b. Rolling
    c. Withering
    d. Lump formation

89. Which is the effect of Ionizing radiation on the thickness of albumin?
    a. Increases
    b. Decreases
    c. Remains constant
    d. None of the above

NG 23 (GROUP B)

90. The edible fleshy part of mango is called
   a. Pericarp
   b. Mesocarp
   c. Endocarp
   d. Epicarp

91. What dairy product is made by heating milk along with substance called rennet?
   a. Cheese
   b. Butter
   c. Chakka
   d. Ghee

92. For pipes, laminar flow occurs when Reynolds number is
   a. Less than 2000
   b. Between 2000 and 4000
   c. Between 4000 and 5000
   d. Between 5000 and 6000

93. A Newtonian fluid is defined as the fluid which
   a. Obeys Hook's law
   b. Is compressible
   c. Obeys Newton's law of viscosity
   d. Is incompressible

94. Which of the following is true about Centrifugal pumps?
   a. It's suitable for corrosive and toxic fluids
   b. It has a high pressure head
   c. Priming is not needed
   d. None of the mentioned

95. The intensity of pressure at any point, in a liquid, is
   a. Directly proportional to the area of the vessel containing liquid
   b. Directly proportional to the depth of liquid from the surface
   c. Directly proportional to the length of the vessel containing liquid
   d. Inversely proportional to the depth of liquid from the surface

96. When the flow in an open channel is gradually varied, the flow is said to be
   a. Steady uniform flow
   b. Steady non-uniform flow
   c. Unsteady uniform flow
   d. Unsteady non-uniform flow

97. Property of a fluid by which molecules of different kinds of fluids are attracted to each other is called
   a. Adhesion
   b. Cohesion
   c. Viscosity
   d. Compressibility

98. Assuming constant temperature condition and air to be an ideal gas, the variation in atmospheric pressure with height calculated from fluid statics is
   a. linear
   b. exponential
   c. quadratic
   d. cubic

99. From the given reaction. $N_2 + 3H_2 \rightleftharpoons 2NH_3$. For producing 34 gms of NH_3, how many moles of N_2 is required?

    a.   1

    b.   2

    c.   3

    d.   4

100. For the given unbalanced reaction $CaSO_4 + NaCl \rightarrow CaCl_2 + Na_2SO_4$. How many $CaSO_4$ in kg is required for producing 1 mole of Na_2SO_4? Assume NaCl in excess.

    a.   136

    b.   156

    c.   176

    d.   196

101. When 32gms of CH_4 is burned with excess oxygen, how many grams of CO_2 are produced?

    a.   44

    b.   88

    c.   132

    d.   176

102. For the given combustion reaction

    $a\ C_4H_{10} + b\ O_2 \rightarrow c\ CO_2 + d\ H_2O$. What is the value of a?

    a.   1

    b.   4

    c.   2

    d.   6.5

103. $HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$ For producing 1 mole of NaCl , how many moles of NaOH are required? (Consider HCl in excess)

    a.   1

    b.   4

    c.   5

    d.   6.5

104. Heat transfer by convection is evaluated as

    a.   The rate of heat transfer across a solid

    b.   The temperature gradient between a fluid and solid

    c.   The rate of heat exchange at the interface between a fluid and a solid

    d.   The rate of variation of the volume fractions of a fluid and a solid

105. Which of the following statements is NOT CORRECT?

    a.   The heat transfer in liquid and gases takes place according to convection

    b.   The amount of heat flow through a body is dependent upon the material of the body

    c.   The thermal conductivity of solid metals increases with rise in temperature

    d.   Logarithmic mean temperature difference is not equal to the arithmetic mean temperature difference

106. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the

    a.   Reynold's number and Prandtl number

    b.   Grashoff's number and Peclet number

    c.   Reynold's number and Grashoff's number

    d.   Prandtl number and Grashoff's number

NG 23 (GROUP B)

107. Total heat is the heat required to
    a.   Change vapour into liquid
    b.   Change liquid into vapour
    c.   Increase the temperature of a liquid or vapour
    d.   Convert water into steam and super heat it

108. What is the ratio of output amplitude to input amplitude for a sinusoidal forcing function in a first order system?
    a.   0
    b.   1
    c.   >1
    d.   <1

109. Response of a linear control system for a change in set point is called
    a.   frequency response
    b.   transient response
    c.   servo problem
    d.   regulator problem

110. Gain margin is equal to the
    a.   Amplitude ratio
    b.   Reciprocal of amplitude ratio
    c.   Gain in P-controller
    d.   Gain in P-I controller

111. Continuous measurement of moisture in paper is done by
    a.   Sling psychrometer
    b.   Hair-hygrometer
    c.   Weighing
    d.   High resistance Wheatstone's bridge circuit

112. The oxygen transfer rate of packaging materials is independent of
    a.   Temperature
    b.   Relative humidity
    c.   Material thickness
    d.   Water activity of food

113. An example of anti-aging additive used in packaging materials is
    a.   Sodium sorbate
    b.   Benzyl benzoate
    c.   Butylated hydroxyl toluene
    d.   Sodium metabisulphate

114. Polymers whose monomers are derived from petrochemical-based monomers is
    a.   Poly(caprolactone)
    b.   Polyhydroxyalkanoates
    c.   Polylactic acid
    d.   Cellulose acetate

115. Transmission rate of a packaging material is proportional to the
    a.   amount of permeant
    b.   surface area
    c.   time
    d.   water activity

_____

16 – GEO-INFORMATICS

(Answer ALL questions)

56. Select the incorrect statement.
    a. In Geodetic surveying, the true meridians at different places are parallel to each other.
    b. The true meridian at any place is not variable.
    c. In Geodetic surveying, the true meridians converge to a point in northern and southern hemispheres.
    d. The maps prepared by national survey departments of any country are based on true meridian.

57. The slope correction for a length of 50m along a gradient of 1 in 20 is
    a. − 6.24mm
    b. − 6.24cm
    c. 6.24mm
    d. 6.24cm

58. The back sight reading on a staff held vertical on a bench mark of R.L. 100.000m, is 1.395m and fore sight reading on a staff held vertically inverted against a beam is 2.665m. Determine the reduced level of the beam.
    a. 101.270m
    b. 96.940m
    c. 104.060m
    d. 98.730m

59. The bearing of a line is 300º and length is 100m, then the latitude and departure respectively of the line will be
    a. −50.0m, −86.6m
    b. +50.0m, +86.6m
    c. −86.6m, +50.0m
    d. +50.0m, −86.6m

60. Correction to be applied on observed distance at non-uniform atmospheric condition prevailing around the instrument and the prism is called as
    a. Temperature and Atmospheric pressure correction
    b. Atmospheric pressure and Humidity correction
    c. First velocity correction
    d. Second velocity correction

61. Different grades are joined together by a
    a. Vertical curve
    b. Transition curve
    c. Reverse curve
    d. Compound curve

62. The latitude (θ) of place and the altitude (α) of the pole are related by
    a. $\theta = 90º − \alpha$
    b. $\theta = \alpha$
    c. $\theta = \alpha − 90º$
    d. Always $\theta < \alpha$

63. The cone angle within which incident energy is focused onto detector is called as
    a. field of view
    b. instantaneous field of view
    c. angle of view
    d. instantaneous angle of view

64. The radiation from the sun is a combination of
    a. electric and magnetic waves in two mutually perpendicular planes
    b. electric and magnetic waves in two mutually parallel planes
    c. Labert and Planck waves in two mutually perpendicular planes
    d. Labert and Planck waves in two mutually parallel planes

65. What is the measure of the radiant flux per unit area?
    a. radiant power
    b. radiance
    c. irradiance
    d. radiant intensity

66. The passive energy from the sea water that can be observed by IR radiometers is emitted from the depth
    a. 100 μm
    b. 200 m
    c. 100 m
    d. 200 μ

67. Which of the following energy is not utilized by LiDAR system?
    a. Shortwave infrared
    b. radiowave
    c. ultraviolet
    d. visible

68. Which of the following sensors is useful to observe the colour of the sea water?
    a. LISS
    b. Seasat
    c. AVHRR
    d. SEAWiFS

69. Which of the following laser systems is designated to extract the chemical properties of target?
    a. DORIS
    b. ALOS
    c. DIAL
    d. Laser Altimeter

70. Which of the following missions possesses the capability of circular polarimetry?
    a. Radarsat
    b. Sentinel
    c. RISAT
    d. PALSAR

71. PPD refers to Polarimetric phase
    a. distance
    b. direction
    c. decomposition
    d. difference

72. The maximum depth up to which the Radar energy can penetrate is known as
    a. Bulk depth
    b. Penetration depth
    c. Skin depth
    d. Extinction depth

73. An image is considered to be a function of a(x,y) where a represents
    a. height of image
    b. width of image
    c. amplitude of image
    d. resolution of image

74. ISODATA stands for
    a. Iterative self-organizing data analysis technique
    b. Interactive self- organizing data analysis technique
    c. Interpolating organizing data analysis technique
    d. Information organizing data analysis technique

75. Which of the following filtering techniques can be used to detect the Roads and railway line?
    a. Sobel filter
    b. Roberts filter
    c. Gaussian filter
    d. Low pass filter

76. Decorrelation refers to
    a. removal of highly correlated bands from the image
    b. reassign values of highly correlated pixels between two bands
    c. nothing to do with band correlation
    d. removes the auto correlative effect among bands

77. The number of grey values are integer powers of:
    a. 4
    b. 2
    c. 8
    d. 1

78. Semantic net is used in
    a. fuzzy logic
    b. Expert system
    c. Artificial Neural Network
    d. Boundary detection

79. Separability of a image class depends on
    a. image statistics
    b. the difference in spectral property of the image features at a particular band
    c. number of training sites
    d. all of the above

80. In principal component transformation of image the first principal component mostly refers to
    a. Overall noise
    b. Overall brightness
    c. Spatial variation
    d. Spectral correlation

81. Expert system is a
    a. set of computer program for narrow problem area
    b. set of computer program for wider problem area
    c. set of rules
    d. set of knowledge

82. Which of the following is associated with fuzzy logic?
    a. Crisp set logic
    b. Many-valued logic
    c. Two-valued logic
    d. Binary set logic

83. The ground coverage of aerial photograph is least and maximum, when the photographs are
    a. True vertical photographs and oblique photographs
    b. Near Vertical photographs and oblique photographs
    c. Near Vertical photographs and high oblique photographs
    d. True vertical photographs and high oblique photographs

84. What is overlap between the 9 & 12 photographs of a strip, if the photographs were taken with the forward overlap of 82%?
    a. 82%
    b. 28%
    c. 64%
    d. 46%

85. The displacement of the statue of Liberty (to the top of the torch) using a single photo as 13.02 mm and the distance from the principal point to the top of the torch as 14 cm. The flying height of the mission was 1000 m. The height of the statue of Liberty is
    a. 930.0m
    b. 93.00m
    c. 107.53m
    d. 10.753m

86. The minimum number of ground control points required in the first model, to do the analog aerotriangulation are
    a. Two horizontal control point and three vertical control point
    b. Three horizontal control point and three vertical control point
    c. Three horizontal control point and four vertical control point
    d. Two horizontal control point and two vertical control point

87. In a stereo pair of aerial photographs, the left aerial photo base is 9.6 mm and right photo base is 9.2 mm. The x-parallax at right photo principal point is
    a. 9.2 mm
    b. 9.4 mm
    c. 9.6 mm
    d. 0.4 mm

NG 23 (GROUP B)

88. The numerical relative orientation to be carried out in analytical stereo plotter using collinearity condition. How many observation equations were formed and how many unknown parameters were introduced, if eight points were measured for numerical relative orientation?
    a. 30 and 32
    b. 32 and 30
    c. 32 and 29
    d. 29 and 32

89. Generation of True orthophoto requires
    a. Aerial photo, Control point, DEM and DHM
    b. Aerial photo, Control point, DEM and DSM
    c. Aerial photo, Control point, DEM and DTM
    d. Aerial photo, Control point, DEM and TIN

90. Digital elevation model height plus height of trees, buildings, and other features elevated above the bare earth is called
    a. Digital Surface Model
    b. Digital Terrain Model
    c. Digital Height Model
    d. Digital Vertex Model

91. The entire system required for advanced drone operations including the aircraft, ground control station, and communications system is called
    a. MAV
    b. UAV
    c. UAS
    d. MUAS

92. The components of a LIDAR system are
    1. Scanner
    2. GNSS
    3. IMU
    4. Clock
    5. Total Station
    a. 1, 2 and 3
    b. 1, 2 and 4
    c. 1, 2, 3 and 4
    d. 1, 2, 3 and 5

93. The ratio in the form of 1: 1,000,000 is a
    a. Statement Scale
    b. Bar Scale
    c. Representative Fraction
    d. Graphical Scale

94. 1:1000,000 can be verbally stated as
    a. One cm to one Km
    b. One m to one Km
    c. One mm to one Km
    d. One mm to one m

95. The projection used to preserve shape is called
    a. Equivalent Projection
    b. Conformal Projection
    c. Equidistant Projection
    d. True Direction Projection

96. The projection used to preserve area is called
    a. Equivalent Projection
    b. Conformal Projection
    c. Equidistant Projection
    d. True Direction Projection

97. The attribute levels of measurements which uses names as labels is
    a. Ordinal
    b. Nominal
    c. Interval
    d. Ratio

98. Vector data model that is not structured is known as
    a. Arc-node Topological Data Model
    b. TIN
    c. Spaghetti Data Model
    d. DEM

99. Which one of following is a Vector Data File?
    a. PCX
    b. GRID
    c. BMP
    d. DLG

100. Which one of following is a Raster Data File?
    a. DLG
    b. DGN
    c. PNG
    d. CGM

101. The measure of how close data are to true or accepted values
    a. precision
    b. Error
    c. Accuracy
    d. Uncertainty

102. The measure of how exact data are measured and stored is
    a. Precision
    b. Error
    c. Accuracy
    d. Uncertainty

103. Uncertainty refers to
    a. Lack of accuracy in the data
    b. Lack of confidence in the use of data
    c. Lack of precision in the data
    d. Lack of error in the data

104. The process that creates an output layer on which the value of each cell is function of the cell at the same location on the input layer is
    a. Neighborhood operations
    b. Regional operations
    c. Extended Neighborhood operations
    d. Local operations

105. The process that create an output layer by identifying cells that intersect with or fall within each region on the input layer is
    a. Neighborhood operations
    b. Regional operations
    c. Extended Neighborhood operations
    d. Local operations

106. TIN is a
    a. Raster Data Model
    b. ER Model
    c. Vector Data Model
    d. Object Oriented Data Model

107. The GIS server is an interface between HTTP server and
    a. Web Browser
    b. HTTP documents
    c. Geographic database
    d. Web Server

108. For land-use analysis, data captured in which of the following portions of spectrum is most useful?
    a. visible and infrared portion
    b. thermal portion
    c. Microwave portion
    d. UV portion

109. RADAR is sensitive to
    a. alignment of the crop
    b. age of the crop
    c. phenology of the crop
    d. health of the crop

110. For generating spectral signature of vegetation species, the best data required is
    a. panchromatic
    b. multispectral
    c. hyperspectral
    d. temporal

111. The land / water interface is quite easily discriminated with
    a. Optical data
    b. SAR data
    c. Sounding data
    d. RAR data

112. Which of the following flood causing factors can not be directly extracted from satellite imagery?
    a. Soil Moisture
    b. Land cover
    c. Topography of land
    d. Interception

113. The spectral band suitable for underground coal fires in mining areas is
    a. Visible
    b. NIR
    c. Thermal
    d. Microwave

114. Which of the following satellite data is useful for air quality monitoring?
    a. Sentinel - 1
    b. Sentinel - 2
    c. Sentinel - 3
    d. Sentinel - 5P

115. Which of the following satellite can capture the reflection of ocean surface in visible and NIR bands?
    a. MODIS
    b. CMS
    c. INSAT
    d. GSAT

_____

NG 23 (GROUP B)

17 –INSTRUMENTATION, ELECTRONICS AND CONTROL ENGINEERING

(Answer ALL questions)

56. The effective resistance of two equal resistors connected in parallel is equal to
    a. twice the resistance of one resistor
    b. ½ the resistance of one resistor
    c. the resistance of one resistor divided by the other
    d. ¼ the resistance of one resistor

57. According to Kirchhoff's Voltage Law, the algebraic sum of all IR drops and EMFs in any closed loop of a network is always
    a. greater than unity
    b. positive
    c. negative
    d. zero

58. For abstracting maximum power from any two given terminals of a circuit, the load resistance across the terminals should be
    a. four times the internal resistance of the network
    b. less than the circuit resistance
    c. equal to the circuit resistance when viewed back from the two terminals
    d. greater than the circuit resistance

59. While calculating Thevenin resistance R_{th}, constant-current sources in the circuit are
    a. replaced by 'opens'
    b. replaced by 'shorts'
    c. treated in parallel with other voltage sources
    d. converted into equivalent voltage sources

60. In a series RL circuit, V_L ————— V_R by ————— degrees.
    a. lags, 45
    b. lags, 90
    c. leads, 90
    d. leads, 180

61. The bandwidth of an RLC series resonant circuit
    a. Depends on its resistance and capacitance
    b. Depends on resonance frequency.
    c. Depends of Q-factor
    d. All of the above

62. Transfer function of the system $\left(\dfrac{y(z)}{x(z)}\right)$ with difference equation
    $y(n) - 4y(n-1) + 3y(n-2) = x(n) + 2x(n-1)$ is
    a. $\dfrac{1 - 4z + 3z^2}{1 + 2z}$
    b. $\dfrac{1 + 2z}{1 - 4z + 3z^2}$
    c. $\dfrac{1 + 2z^{-1}}{1 - 4z^{-1} + 3z^{-2}}$
    d. $\dfrac{1 - 4z^{-1} + 3z^{-2}}{1 + 2z^{-1}}$

63. The fundamental period of signal $x(t) = \cos 60\pi t + \sin 50\pi t$
    a. 0.1 Sec
    b. 0.2 Sec
    c. 0.3 Sec
    d. 0.4 Sec

64. Frequency response of impulse function contains
    a. Only low frequencies
    b. Only high frequencies
    c. Only resonant frequency
   d. All of the above

65. Convolution of $x_1(t) = tu(t)$ and $x_2(t) = u(t)$ is

a. $u(t)$

b. $tu(t)$

c. $\dfrac{t^2}{2} u(t)$

d. $\dfrac{t^3}{3} u(t)$

66. Number of complex multiplication required for N-point DFT using direct computation method is

a. $2N$

b. $(N-1)$

c. $N(N-1)$

d. N^2

67. Final value of $X(t)$ whose $X(S) = \dfrac{S^2 + 5S + 5}{S^2 + 7S + 2}$ is given by

a. 0

b. 5

c. 2

d. $\dfrac{5}{2}$

68. Which of the following circuits is used to prevent a signal from exceeding a predetermined reference voltage level?

a. Instrumentation amplifier

b. Rectifier

c. Clamper

d. Clipper

69. If a transistor has a β of 300 and a base current and I_B of 15 μA, then the collector current I_C is

a. 45 mA

b. 4.5 mA

c. 0.45 mA

d. 0.05 μA

70. Which of the following is the region where the drain current has a linear response to changes in the drain to source voltage?

a. Breakdown region

b. Ohmic region

c. Saturation region

d. Pinch off region

71. An OPAMP added circuit is constructed using inverted amplifier configuration. If the three inputs are –2 V, +7 V and –1 V and if all the resistors connected in the circuit are 1K, the output voltage is

a. –5 V

b. +5 V

c. –4 V

d. +4 V

72. A Colpitts oscillator circuit having the value of 12 nf of two capacitors connected in parallel with an inductor of 10mH. Determine the frequency of oscillations.

a. 0.0486 Hz

b. 0.0486 kHz

c. 20.547 kHz

d. 20.547 Hz

73. In a Phase Locked Loop, the widest frequency range among the following is

a. lock in range

b. free running range

c. topped range

d. capture range

74. A "2^n:1" MUX can be used to obtain

a. Select 1 input from n inputs using 2^n control lines

b. Select n inputs from 2^n inputs using 1 control line

c. Select 2^n inputs from n inputs using 1 control line

d. Select 1 input from 2^n inputs using n control lines

75. Which of the following flip-flops has more number of don't care conditions in its excitation table?

a. RS flip-flop

b. JK flip-flop

c. D flip-flop

d. T flip-flop

76. Which one of the following provides protection against software lock-up?

a. Real Time clock

b. Watchdog Timer

c. Counter

d. Timer

NG 23 (GROUP B)

77. In an ADC, the signal EOC is
   a. "Enabling of chip" and is an input signal
   b. "End of conversion" and is an output signal
   c. "Enabling of chip" and is an output signal
   d. "End of conversion" and is an input signal

78. The 8051 microcontroller has _____ bit addressable SFRs.
   a. 8
   b. 11
   c. 16
   d. 21

79. An 8-bit bipolar ADC acquires an input signal ranges from –5V to +5V. What is the smallest input change that can cause the ADC to provide one LSB change?
   a. 39.22 mV
   b. 19.6 mV
   c. 9.78 mV
   d. 4.89 mV

80. A Wheatstone bridge is balanced with all the four resistances equal to $1k\Omega$ each. The bridge supply voltage is 100 V. The value of one of the resistances is changed to $1010 \ \Omega$. The output voltage is measured with a voltage measuring device of infinite resistance. The bridge sensitivity is
   a. $2.5 \ mV/\Omega$
   b. $10 \ mV/\Omega$
   c. $25 \ mV/\Omega$
   d. $10 \ V/\Omega$

81. What are the disadvantages of PMMC instruments?
   (i) The scale is uniformly divided
   (ii) The torque-weight ratio is found to be high
   (iii) The power consumption is very low
   (iv) Instruments can be used for dc measurements only

   a. (i) and (ii)
   b. (i) and (iii)
   c. (iii) and (iv)
   d. (iv) only

82. Identify the damping method that is preferably used with dynamometer type instruments
   a. Air friction damping
   b. Eddy current damping
   c. Fluid friction damping
   d. Electromagnetic damping

83. A dc potentiometer is designed to measure up to about 2 volts with a slide wire of 800 mm. A standard cell of emf 1.18 volt obtains balance at 600 mm. A test cell is seen to obtained balance at 680 mm. The emf of the test cell is
   a. 1.50 volts
   b. 1.00 volts
   c. 1.34 volts
   d. 1.70 volts

84. Flux density in instrument transformers must be designed to be
   a. sufficiently low to reduce core losses
   b. sufficiently high to reduce core section and hence reduce length of winding
   c. sufficiently low to prevent core saturation
   d. properly optimized to have a balance among (a)-(c)

85. In a CRO, the sawtooth voltage is applied at the
   a. cathode
   b. accelerating anode
   c. vertical deflecting plates
   d. horizontal deflecting plates

86. The 'dip effect' is an effect which is observed in _____ apparently due to contraction in liquid volume.
   a. Mercury in steel thermometer
   b. Thermocouple
   c. RTD
   d. Pyrometers

87. In mounting of orifice, the common tapping of d1 = 2½ D and d2 = 8D is _____ type of tapping.
   a. Pipe taps
   b. Radius taps
   c. Flange taps
   d. Corner taps

88. A strain gauge with gauge factor 2 and resistance $100\,\Omega$ is placed in an equal arm bridge circuit. The supply voltage is 10V. If the detector resistance is also $100\,\Omega$. Then the sensitivity of the detector is
    a. 0.025 µA/µcm/cm
    b. 0.25 µA/µcm/cm
    c. 0.25 µA/cm/µcm
    d. 0.025 µA/cm/µcm

89. The hydrogen ion concentration of a solution is $1 \times 10^{-8}\,M$. Then, the pH value of the solution is
    a. 6
    b. −6
    c. 8
    d. −8

90. A hall effect transducer is used for measurement of a magnetic field of 1.5 Wb/m² with a copper transducer for which the Hall effect coefficient is -52×10^{-12} V-m/A-Wbm². The thickness of the element is 2mm and the current passing is 5A. Then, the voltage generated is
    a. −390mV
    b. -390×10^{-9} V
    c. 0.195 µA
    d. −0.195 µA

91. The thermodynamical relationship between the output millivolt and junction temperature in thermocouples is established by _____ effect.
    a. Joule
    b. Seebeck
    c. Law of intermediate metals
    d. Law of intermediate temperatures

92. For spectroscopic analysis, large sized cuvettes are used for
    a. samples having components of lesser concentration
    b. samples whose concentration is more
    c. large sized solid samples
    d. samples having more number of components

93. Which of the following statements is false for double beam instruments?
    a. Fluctuations due to radiation source are minimized.
    b. It requires adjustment of transmittance at 0% and 100% at each wavelength
    c. Calibration is done only at the beginning
    d. Results are fast and accurate

94. Which of the following information can be obtained from a chromatogram graph?
    a. Number of components in a sample
    b. Concentration of each component in the sample
    c. Number of components in a sample & concentration of each component in the sample
    d. Number of components in a sample, concentration of each component in the sample and retention time

95. Ion selective electrodes measure
    a. activity of a specific ion dissolved in a solution
    b. Potential of specific ion dissolved in a solution
    c. Movement of specific ion dissolved in a solution
    d. Migration rate of specific ion dissolved in a solution

96. Choose the correct sequence of mass spectroscopy procedure
    p. The ion signal is processed into mass spectra.
    q. The ions are detected usually by a quantitative method.
    r. The ions are separated according to their mass to charge ratio in an analyzer by electromagnetic fields.
    s. The components of the sample are ionized by one of a variety of methods (e.g. by impacting them with an electron beam) which result in the formation of charged particles.
    t. A sample is loaded into the MS instrument and undergoes vaporization
    a. $p \rightarrow q \rightarrow r \rightarrow s \rightarrow t$
    b. $t \rightarrow s \rightarrow r \rightarrow q \rightarrow p$
    c. $p \rightarrow t \rightarrow r \rightarrow s \rightarrow q$
    d. $q \rightarrow t \rightarrow r \rightarrow s \rightarrow p$

97. In NMR spectroscopy, the spinning nuclei in strong magnetic field must be irradiated by a ——————— field which is ——————— to it
    a. Strong, parallel
    b. Strong, perpendicular
    c. Weaker, perpendicular
    d. Weaker, parallel

98. An optical time-domain reflectometer used to find
    a. Cable fault position
    b. Cable length
    c. Cable fault position and cable length
    d. Cable type

NG 23 (GROUP B)

99. Multimode step index fiber has
    a. Large core diameter and large numerical aperture
    b. Large core diameter and small numerical aperture
    c. Small core diameter and large numerical aperture
    d. Small core diameter and small numerical aperture

100. Which of the following is described by the concept of numerical aperture in an optical fibre?
    a. Light scattering
    b. Light collection
    c. Light dispersion
    d. Light polarization

101. Which optical devices are adopted for routing signals from one waveguide to another?
    a. Optical combiner
    b. Optical splitter
    c. Optical coupler
    d. Optical enhancer

102. If the angle of incidence is 25° and angle of refraction is 32°, find the refractive index of the media.
    a. 0.08
    b. 0.01
    c. 0.8
    d. 0.1

103. When light travels from higher refractive index medium to lower refractive index medium
    a. It is reflected away
    b. It is absorbed partially
    c. It is scattered in all directions
    d. It is refracted away from the normal

104. In a signal flow graph loops are said to be non-touching if they
    a. do not touch alternate nodes
    b. do not touch any node
    c. do not posses any common node
    d. posses one common node

105. The root locus is the path of the roots of the characteristic equation traced out in the s-plane as
    a. the input of the system is changed
    b. the output of the system is changed
    c. a system parameter is changed
    d. the sensitivity is changed

106. In a synchro error detector, the angular difference of shaft positions are converted into
    a. AC voltage using a synchro control transformer at the input and a synchro transmitter at the output
    b. DC voltage using a synchro control transformer at the input and a synchro transmitter at the output
    c. AC voltage using a synchro transmitter at the input and a synchro control transformer at the output
    d. DC voltage using a synchro transmitter at the input and a synchro control transformer at the output

107. A PID controller has the transfer function $2 + \dfrac{0.4}{S}$ with the unit of time expressed in minute. The parameter proportional band and reset time for the above controller are respectively,
    a. 200% and 0.4 minute
    b. 50% and 0.4 minute
    c. 200% and 5minutes
    d. 50% and 5 minutes

108. The Nyquist plot of loop transfer function G(s)H(s) of a closed loop control system passes through the point (–1, j0) in the G(s)H(s) plane. The phase margin of the system is
    a. 0°
    b. 45°
    c. 90°
    d. 180°

109. The transfer function of a compensating network is given as $G_c(S) = \dfrac{S + z}{S + p}$ when $|z| < |p|$, the network is called the
    a. Phase lag network
    b. Phase lead network
    c. Phase lead lag network
    d. Phase shifting network

110. Consider the following series RLC circuit. It is having an input voltage, $v_i(t)$ and the current flowing through the circuit is $i(t)$. Obtain the system matrix with the state vector X given by $\begin{bmatrix} i(t) \\ v_c(t) \end{bmatrix}$ where $v_c(t)$ the voltage across capacitor.
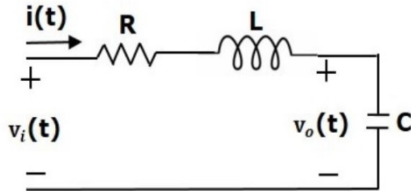
a. $\begin{bmatrix} \dfrac{R}{L} & \dfrac{1}{L} \\ \dfrac{1}{C} & 0 \end{bmatrix}$

b. $\begin{bmatrix} \dfrac{-R}{L} & \dfrac{-1}{L} \\ \dfrac{1}{C} & 0 \end{bmatrix}$

c. $\begin{bmatrix} \dfrac{-R}{C} & \dfrac{-1}{L} \\ \dfrac{1}{C} & 0 \end{bmatrix}$

d. $\begin{bmatrix} \dfrac{-R}{L} & \dfrac{-1}{L} \\ \dfrac{1}{L} & 0 \end{bmatrix}$

111. Obtain the transfer function of the following system

$$\dot{X} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix}[u]$$

$$Y = \begin{bmatrix} 0 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

a. $\dfrac{1}{S^2 + S + 1}$

b. $\dfrac{1}{S^3 + S + 1}$

c. $\dfrac{1}{S^3 + S^2 + S + 1}$

d. $\dfrac{1}{S^2 - S - 1}$

112. The requirement for controllability for the following controllability matrix is, the determinant of Q_C

$$Q_C = \begin{bmatrix} B & AB & A^2B & \dots & A^{n-1}B \end{bmatrix}$$

a. Equal to zero
b. Equal to one
c. Not Equal to zero
d. Not Equal to one

113. The condition required to turn ON the Motor according to the following ladder diagram is
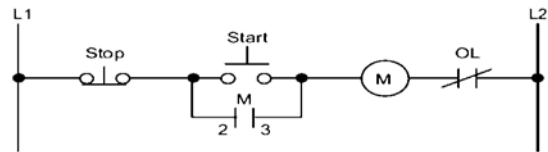
a. Start and stop buttons pressed and OL not energised
b. Start and stop buttons pressed and OL energised
c. Start button pressed, stop not pressed and OL energised
d. Start button pressed, stop not pressed and OL not energised

114. Which of the following is a digital automated industrial control systems that uses geographically distributed control loops?

a. SCADA
b. DCS
c. DDC
d. PLC

115. Which of the following is the only protocol which supports simultaneous analog and digital communication?

a. Fieldbus
b. Profibus
c. HART
d. 4 – 20 mA signal

PART III

18 – LEATHER TECHNOLOGY

(Answer ALL questions)

56. Which is the external layer of epidermis?
    a. Stratum spinosum
    b. Stratum granulosum
    c. Stratum lucidum
    d. Stratum corneum

57. Which type of cells are predominantin epidermis?
    a. Keratinocyte
    b. Fibroblast
    c. Chondrocyte
    d. Melanocytes

58. Based on histological structure which animal's raw material have trios pattern in the grain layer, which is prominent in the leather.
    a. Buff
    b. Cow
    c. Goat
    d. Sheep

59. Which amino acid doesn't occur in keratin?
    a. Glycine
    b. Proline
    c. Hydroxylysine
    d. Tyrosine

60. Type II collagen is a
    a. Homotrimer
    b. Exotrimer
    c. Heterotrimer
    d. Heterotetramer

61. Which of the following amino acids is hydrophobic in nature?
    a. Threonine
    b. Serine
    c. Valine
    d. Glutamine

62. The length of a type I collagen triple helix is
    a. 30 nm
    b. 300 nm
    c. 300 mm
    d. 50 nm

63. With respect to Collagen, telopeptides are
    a. Non-helical overhangs on both terminal ends
    b. Helical regions
    c. Carbohydrate moieties
    d. Lipid moieties

64. To estimate/quantify collagen in tissue or solution, which assay is carried out?
    a. Fehling's Assay
    b. Benedict's Assay
    c. Hydroxyproline assay
    d. Chrome Assay

65. In which of the following tissues, collagen is not the major structural protein?
    a. Skin
    b. Bone
    c. Hair
    d. Cartilage

66. In which part of the hide,fibers are weak?
    a. Neck
    b. Belly
    c. Butt
    d. Shoulders

67. At critical temperature, the surface tension of liquid is
    a. Infinity
    b. Zero
    c. Remain same as in other temperature
    d. Similar to the density of liquid

68. The hydrophilic-lipophilic balance of a ————— is a measure of the degree to which it is hydrophilic or lipophilic towards any compounds
   a. Surfactant
   b. Binder
   c. Dye
   d. Resin

69. Which of the following preservation methods may contribute to halophilic bacterial attack to skin/hide?
   a. Chilling
   b. Heating
   c. Salting
   d. Gamma Irradiation

70. If you were given a specimen of an active, motile microorganism, which of the following types of microscopy would be the most effective in visualizing the live microbe?
   a. bright-field microscopy
   b. dark-field microscopy
   c. fluorescence microscopy
   d. phase-contrast microscopy

71. In tanneries, sulphuric acid is preferred over formic acid for pickling is because sulphuric acid is
   a. Non swelling acid
   b. Very expensive
   c. Slow action
   d. Strong acid

72. Which type of tanning is suitable for making Chamois leather?
   a. Chromium tanning
   b. Zirconium tanning
   c. Vegetable tanning
   d. Oil tanning

73. Tannins present in plants are
   a. Secondary metabolites
   b. Primary metabolites
   c. Protein
   d. Complex carbohydrate

74. Which type of following tanning agents involves interaction with basic amino acid to form covalent bond?
   a. Chromium
   b. Aluminium
   c. Aldehyde
   d. Iron

75. Case hardening in vegetable tanning process is due to
   a. Discoloration of phenols
   b. Improper fixation
   c. High astringent tannins
   d. Denaturation of collagen

76. Which of the following is an important property of sole leather?
   a. Run
   b. Drape
   c. Apparent density
   d. Stretch

77. Ageing of chrome tanned leathers leads to
   a. Fixation Chromium
   b. Striping of Chromium
   c. Distribution of Chromium
   d. Diffusion of Chromium

78. In normal chromic chloride, the chloride atoms are attached to chromium by ————— valence forming electrovalent linkages.
   a. Primary
   b. Secondary
   c. Outer
   d. Auxiliary

79. Which type of tanning is prepared to achieve better abrasion property in leather?
   a. Chromium
   b. Aluminium
   c. Zirconium
   d. Aldehyde

NG 23 (GROUP B)

80. What is the degree of tannage preferred for vegetable tanned upper leather?
    a. Minimum 20
    b. Minimum 30
    c. Minimum 40
    d. Minimum 50

81. Gallotannins and ellagitannins are a type of
    a. Hydrolysable tannin
    b. Condensed tannin
    c. Complex tannin
    d. Catechol tannins

82. Vegetable tannin predominantly react with collagen through
    a. Covalent bonding
    b. Coordinate covalent bonding
    c. Hydrogen bonding
    d. Peptide bonding

83. The amount of fixed tannin bound to 100g of hide substance is
    a. Water insoluble tannins
    b. Reddening effect
    c. Degree of tannage
    d. Collagen stabilization

84. Barkometer is used to measure the
    a. amount of tannin in solution
    b. shrinkage temperature
    c. protein content
    d. abrasion resistance

85. Which of the following aldehyde tanning systems involves in unipoint fixation?
    a. Glutaraldehyde
    b. Glyoxal
    c. Formaldehyde
    d. Wattle

86. Which type of syntan is mainly prepared by the condensation of urea, thio-urea, dicyandiamide, and melamine either as a single amino base or in mixture?
    a. Phenolic Syntan
    b. Amino resin Syntan
    c. Neutralization Syntan
    d. Bleaching Syntan

87. Auxochrome is responsible
    a. for abrasion
    b. for fastness property
    c. to form stable crosslinks
    d. to increase the color intensity

88. Synthetic tanning agents prepared by sulphonation followed by condensation is called as
    a. Novalac
    b. Neradol
    c. Melamine resin
    d. Acrylic resin

89. Which of the following syntans are preferable for belly filling?
    a. Melamine resins
    b. Phenol- Formaldehyde
    c. Formaldehyde
    d. Vegetable Tannins

90. Which one of the following is the precursors for phenol-formaldehyde syntan?
    a. Resorcinol
    b. Sulfonyl chloride
    c. Acetone
    d. Ethylene oxide

91. Which chemical is used as a crosslinker for phenol-formaldehyde syntan?
    a. Chromium
    b. Phenol
    c. Toluene
    d. Formaldehyde

92. Building blocks for triglycerides and phospholipids are called as
    a. Carbohydrates
    b. Proteins
    c. Fatty acids
    d. Amino acids

93. Condensation is an important step in syntan manufacture, which contributes towards
    a. Solubility
    b. Crosslinking
    c. Dispersion
    d. Diffusion

94. Temperature at which an amorphous material like glass, high polymer etc., changes from a brittle, vitreous state to a plastic is defined as
    a. Denaturation temperature
    b. Glass Transition temperature
    c. Shrinkage temperature
    d. Cold crack temperature

95. Attenuated Total Reflectance is one of the modes of the following spectroscopic technique
    a. Circular Dichroism
    b. NMR
    c. X-ray Diffraction
    d. FTIR

96. If Poly unsaturated fatty acid has first double bond, 6 carbons away from the methyl end known as
    a. omega 3 Fatty acid
    b. omega 6 Fatty acid
    c. omega 2 Fatty acid
    d. omega 1 Fatty acid

97. Which of the following agents is involved in preparing white pigment?
    a. Titanium dioxide
    b. Chromic oxide
    c. Iron oxide
    d. Chromium sulphate

98. Covering ability of pigment can be enhanced by
    a. Decreasing the particle size
    b. Increasing the particle size
    c. Decreasing the contact surface
    d. Decreasing the Interfaces

99. Compound added to provide elasticity of the grain layer to withstand crack during natural movement is
    a. surfactants
    b. pigments
    c. binders
    d. Plasticizers

100. Low refractive index pigments is also called as
    a. Extender
    b. Binder
    c. Wax
    d. Plasticizer

101. Water soluble acid or basic dyes that are converted to insoluble pigments by precipitation with metallic salts or acids is called as
    a. Toners
    b. Dyestuffs
    c. Earth colours
    d. Lakes

102. Which finishing coat is used to fill up the empty spaces between the corium major and minor for better break and tightness of the grain?
    a. Bottom Coat
    b. Intermediate Coat
    c. Top Coat
    d. Fixing Coat

103. Which layer in finishing protects against scratch, frictional damages and abrasion?
    a. Top coat
    b. Intermediate coat
    c. Base coat
    d. Clearing coat

NG 23 (GROUP B)

104. Which type of chemical is preferred for covering the defect in corrected grain finish?
   a. Albumin
   b. Casein
   c. Acrylic
   d. Wax

105. Removal of unfixed vegetable tannins is known as _____
   a. Scudding
   b. Scouring
   c. Bleaching
   d. Stripping

106. What is the unit of water vapour permeability test?
   a. mg/cm^2/h
   b. mg/cm^2
   c. mg/h
   d. cm^2/h

107. Which type of shape felt pads are used in Veslic rubbing test?
   a. Square
   b. Circular
   c. Rectangular
   d. Triangular

108. The property, which indicates lasting characteristic of upper leather
   a. Tensile strength
   b. Tear strength
   c. Stretching of leather at different percentages
   d. Uni-directional stretching over round shape mandle

109. Principle of mean forming
   a. Conversion of 3D surface of last in 2D form
   b. Conversion of 2D leather into 3D shoe shape
   c. Calculation of leather requirement for a given style
   d. Converting shoe upper in lasting form

110. In Crockmeter test, which kind of standard material is used for colour transfer?
   a. Square felt
   b. Circular felt
   c. Cotton lawn
   d. Blue wool

111. The initial step in consumer decision making process is
   a. Need recognition
   b. Information search
   c. Evaluation of alternatives
   d. Purchase

112. Objective of crimping operation is
   a. Discoloration of upper by heating
   b. Ironing the vamp in symmetric manner
   c. Ironing the vamp in asymmetric manner
   d. Reduce the thickness of upper materials

113. Bell knife is used in
   a. splitting machine
   b. edge setting machine
   c. skiving machine
   d. ink marking machine

114. Which of Maslow's need involves the desire for self-fulfilment, to become all that one is capable of becoming?
   a. Safety
   b. Self-actualization
   c. Physiological
   d. Self Esteem

115. Groups in which a person interacts continuously and informally such as family, friends, neighbours and co-workers
   a. Secondary groups
   b. Tertiary groups
   c. Primary groups
   d. Reference groups

_____

19-MATERIAL SCIENCE & CERAMIC TECHNOLOGY

(Answer ALL questions)

56. The stacking sequence in a face centered cubic (FCC) close packed structure is
    a. AAAAAA
    b. ABABAB
    c. ABCABC
    d. AABBAA

57. The lattice parameter 'a' in a FCC unit cell is given by
    a. $\dfrac{r}{2\sqrt{2}}$
    b. $\dfrac{r}{\sqrt{2}}$
    c. $\sqrt[2]{2r}$
    d. $\sqrt{2r}$

58. Crystals like diamond and silicon are brittle because
    a. They contain no dislocations
    b. They are non crystalline
    c. The stress to move a dislocation is high in them
    d. They contain very few dislocations

59. A plane intersects the coordinate axes at $x = 2/3, y = 1/3$ and $z = 1/2$, the miller indices of t this plane is
    a. 9,3,2
    b. 4,3,2
    c. 4,2,3
    d. 3,6,4

60. X-rays are used for diffraction studies in crystals because
    a. The wavelength of radiation is of the same range as that of interatomic spacing
    b. X-rays penetrate crystals
    c. Crystals have atoms / molecules capable of scattering X-rays
    d. None of the above

61. Choose the wrong statement
    a. In Laue method monochromatic X-ray beam is used
    b. In powder method monochromatic X-ray beam is used
    c. In rotating method monochromatic X-ray beam is used
    d. In Laue method white X-radiation is used

62. Burgers vector defines
    a. The magnitude of point defect
    b. Orientation of different crystal planes
    c. Magnitude and direction of dislocation
    d. Volume defect

63. Interstitial diffusion is generally faster than diffusion by vacancy mode. This is because
    a. Number of interstitial sites is greater than vacancies
    b. Vacancy diffusion requires more energy than interstitial diffusion
    c. Interstitial species are smaller than substitution species
    d. All of the above

64. In a crystal if $a = b \neq c$ and interfacial angles $\alpha = \beta = \gamma = 90°$ then it belongs to the system
    a. Cubic
    b. Tetragonal
    c. Orthorhombic
    d. Triclinic

65. In ionic crystals an ion displaced from a regular site to an interstitial site is called
    a. Electronic defect
    b. Schottky defect
    c. Frenkel defect
    d. None of the above

NG 23 (GROUP B)

66. In a single component system, the maximum number of phases that can coexist in equilibrium is
   a. 2
   b. 3
   c. 4
   d. 5

67. The reaction that yields two solid phases on cooling a single solid phase is called
   a. Eutectoid
   b. Peritectoid
   c. Eutectic
   d. Peritectic

68. Martensitic transformations
   a. Are diffusion controlled
   b. Yield two products of different composition
   c. Are shear processes
   d. Yield a soft product in steels

69. The process of reheating the martensitic steel to reduce its brittleness without any significant loss in its hardness is called
   a. Normalizing
   b. Annealing
   c. Quenching
   d. Tempering

70. Fe-C alloys with _____ percentage of carbon content are called as cast iron
   a. $0.3 - 0.6$
   b. $0.8 - 1.4$
   c. $0.6 - 0.8$
   d. >2

71. Which of the following is a false statement for grain growth?
   a. The grains start growing
   b. Grain growth accelerates with increase in temperature
   c. Decrease in free energy
   d. Increase in surface energy

72. Condensation polymerization of _____ produces Bakelite.
   a. Propylene
   b. Phenol and formaldehyde
   c. Phenol and acetaldehyde
   d. Urea and formaldehyde

73. Which of the following types of composite is not classified under the category of a number of layers
   a. Unidirectional fiber reinforced
   b. Laminar
   c. Sandwich panels
   d. Particulate composites

74. Nanoscale aluminum oxide increases the
   a. Conductivity
   b. Resistance
   c. Ductility
   d. Stability

75. When does a shape memory alloy return to its original shape?
   a. At transition temperature
   b. At curie temperature
   c. At memory transfer temperature
   d. At normal temperature

76. Which of the following is true regarding the true stress - strain curve and engineering Curve
   a. The true stress-strain curve shifts up and to the left of the engineering stress strain curve before necking
   b. The true stress-strain curve shifts up and to the right of the engineering stress strain curve before necking
   c. The true stress-strain curve shifts down and to the left of the engineering stress strain curve before necking
   d. Both the true stress - strain and Engineering stress strain curves are identical.

77. Fatigue failure occurs due to
    a. Extended constant loading
    b. Extended cyclic loading
    c. Diffusion of atoms
    d. Movement of dislocations

78. Which of the following is known as the Griffith equation?
    a. $\sigma = \left(2\gamma E / \pi C\right)^{1/2}$
    b. $\sigma = \left(\gamma E / \pi C\right)^{1/2}$
    c. $\sigma = \left(\gamma E / 2\pi C\right)^{1/2}$
    d. $\sigma = \left(\pi C / \gamma E\right)^{1/2}$

79. Hall-Petch relation is connected with
    a. Mechanical properties
    b. Ferromagnetic materials
    c. Resistivity of impure metals
    d. Diffusion

80. If K and σ be the thermal and electrical conductivities of a metal at temperature T then
    a. $\dfrac{KT}{\sigma} = \text{constant}$
    b. $\dfrac{K\sigma}{T} = \text{constant}$
    c. $\dfrac{\sigma}{KT} = \text{constant}$
    d. $\dfrac{K}{\sigma T} = \text{constant}$

81. According to Matthiessen's rule, if ρ_0 and $\rho(T)$ are the temperature independent and dependent parts of the resistivity of a metal, then the total resistivity is
    a. $\rho = \rho_0 - \rho(T)$
    b. $\rho_0 = \rho + \rho(T)$
    c. $\rho = \rho_0 + \rho(T)$
    d. $\rho = \rho_0 / \rho(T)$

82. At 0 K a semiconductor acts as
    a. Superconductor
    b. A good conductor
    c. An insulator
    d. Same as semiconductor

83. Electronic polarization
    a. Increases with temperature
    b. Decreases with temperature
    c. is independent of temperature
    d. None of the above

84. The most characteristic feature of an antiferromagnetic material is
    a. Appearance of magnetic domains
    b. Hysteresis behavior
    c. A sharp minimum in the susceptibility versus temperature curve
    d. A sharp maximum in the susceptibility versus temperature curve

85. The area of the hysteresis loop of a ferro magnetic material gives
    a. The coercive force
    b. The remanent flux density
    c. Intensity of magnetization of the material
    d. Energy that is consumed in taking the material through one complete cycle of magnetization

86. For an electrically neutral atom, the atomic number is ———————— number of electrons
    a. Greater than
    b. Less than
    c. Equal to
    d. Zero

87. Which of the following quantum numbers designates the subshell?
    a. Principal
    b. Azimuthal
    c. Magnetic
    d. Spin

88. The weight of Cu and Si are 63.54 and 28.09 respectively. Find the % of Si in Cu_5Si
    a. 9.12
    b. 8.12
    c. 10.12
    d. 11.12

NG 23 (GROUP B)

89. Elastic strain energy E in terms of Burger vector b is given by

 a. $E = -\mu b^2 / 2$

 b. $E = \mu b^2 / 4$

 c. $E = \mu b^2 / 2$

 d. $E = -\mu b^2 / 4$

90. Finer grains are less susceptible to
 a. Brittle fracture
 b. Ductile fracture
 c. Intergranular
 d. Transgranular

91. In which of the following phases of steel will cementite be in particle form
 a. Martensite
 b. Ferrite
 c. Perlite
 d. Bainite

92. The maximum number of phases that coexist in a C system is
 a. $(C + 2)$
 b. $(C - 1)$
 c. $P(C - 1)$
 d. $C - P + 2$

93. Diffusion flux is proportional to
 a. Concentration gradient
 b. Thermal gradient
 c. Magnetic gradient
 d. Electric gradient

94. The slowest cooling rate is obtained when steel is quenched in
 a. Air
 b. Brine
 c. Fused salt
 d. Oil

95. The side group in polyvinyl chloride is
 a. H, Cl, Cl, Cl
 b. H, H, H, Cl
 c. H, H, H, H
 d. H, H, CH_3, Cl

96. Measure of ductility is
 a. Percentage Elongation
 b. Modulus of resilence
 c. Modulus of toughness
 d. Ultimate tensile strength

97. Proof stress corresponds to
 a. Elastic limit
 b. Lower yield point
 c. Higher yield point
 d. A specified strain

98. Which hardness method can measure hardness of a grain?
 a. Knoop
 b. Shore
 c. Rockwell
 d. Vicker

99. In the Griffith equation, if C is the crack length, then the fracture stress is proportional to
 a. C
 b. 2C
 c. $\sqrt{C}$
 d. $1 / \sqrt{C}$

100. In S-N curve, the stress at which the curve becomes horizontal is known as
 a. Endurance limit
 b. Elastic limit
 c. Plastic limit
 d. Proportionality limit

101. Which of the following polymorphic transformations of silica has the maximum high volume expansion?
 a. Alpha quartz to beta quartz
 b. Alpha cristobalite to beta cristobalite
 c. Beta quartz to beta tridymite
 d. Beta quartz to beta cristobalite

102. The method suitable for size separation in clays is
    a. Levitation technique
    b. Acid leaching
    c. High intensity magnetic separator
    d. Froath flotation

103. Feldspar is rich in the ——————— variety of Cornish stone.
    a. Black
    b. Purple
    c. Yellow
    d. White

104. Presence of ——————— impurity in magnesite is susceptible to polymorphic transformation leading to crumbling.
    a. Alumina
    b. Lime
    c. Monticellite
    d. Dicalcium silicate

105. Decomposition products that will be observed when dolomite is fired at 600°C are
    a. $CaCO_3 + MgCO_3$
    b. $CaO + MgCO_3$
    c. $CaCO_3 + MgO$
    d. $CaO + MgO$

106. Sanitary wares are predominantly produced by _____ process.
    a. Pressing
    b. Extrusion
    c. Gel casting
    d. Slip casting

107. Difference in count between the ware fabricated in green state and that placed for bisque firing is called as
    a. Ware count
    b. Bisque loss
    c. Clay loss
    d. Bisque count

108. Wash basins for use in factories or hospitals are of ——————— body type.
    a. Earthenware
    b. Stoneware
    c. Vitreous China
    d. Fireclay

109. Colemanite is a source of
    a. Lime
    b. Lime and boron oxide
    c. Soda and lime
    d. Soda and boron oxide

110. In glaze composition, sum of ——————— oxides should be equal to unity.
    a. Acidic
    b. Amphoteric
    c. Basic
    d. Acidic and basic

111. Whitlockite is a polymorph of
    a. Tri Calcium Phosphate
    b. Hydroxyapatite
    c. Al_2O_3
    d. ZrO_2

112. Which of the following is the potential on the surface of the charged particle moving through the liquid?
    a. Zeta potential
    b. Electrostatic potential
    c. Electric potential
    d. Work potential

113. Natural fiber is
    a. Sisal
    b. Nylon
    c. PAN
    d. PET

114. Fiber flexibility is given as ——————— where E is modulus and d is diameter.
    a. $32 / \pi E d^4$
    b. $18 / \pi E d^2$
    c. $64 / \pi E d^4$
    d. $128 / \pi E d^2$

115. Mrozowski cracks are
    a. Basal plane cracks
    b. Grain boundary cracks
    c. Surface cracks
    d. Interfacial cracks

———————

NG 23 (GROUP B)

20 — PHARMACEUTICAL TECHNOLOGY

(Answer ALL questions)

56. The conversion of NAD to NADH is an example of reduction because
    a. the pyridine ring loses electrons (and a hydrogen)
    b. the pyridine ring gains electrons (and a hydrogen)
    c. the adenine ring loses electrons
    d. the adenine ring gains electrons

57. Which of the following statements about homeostasis is correct?
    a. Homeostasis involves large changes within the normal range
    b. Homeostasis is usually maintained by positive feedback
    c. Homeostasis of extracellular fluids is not dependent on exchanges with the intracellular fluid
    d. A disruption to homeostasis can result in pathophysiological changes in the body

58. The process of glycolysis
    a. requires a pathway of chemically coupled phosphoryl-transfer reactions
    b. uses 2 ATP molecules and forms 2 ATP molecules and one NADH molecule
    c. occurs in the mitochondria
    d. converts glucose into two glycerate molecules

59. Which of the following is an optically inactive amino acid?
    a. glycine
    b. serine
    c. phenylalanine
    d. valine

60. At neutral pH, a mixture of amino acids in solution would be predominantly
    a. dipolar ions
    b. nonpolar molecules
    c. positive and monovalent
    d. hydrophobic

61. In the breakdown of muscle glycogen, the predominant product is
    a. glucose
    b. glucose 1-phosphate
    c. UDP-glucose
    d. maltose

62. Which of the following enzymes is activated by direct binding of cAMP to a regulatory subunit?
    a. adenylate cyclase
    b. protein kinase A
    c. phosphorylase kinase
    d. protein phosphatase

63. The protein that binds and directly reduces the terminal electron acceptor in mitochondrial electron transport is
    a. cytochrome oxidase
    b. succinate dehydrogenase
    c. coenzyme QH2
    d. NADH:Q reductase

64. Which combination of cofactors is involved in the conversion of pyruvate to acetyl-CoA?
    a. NAD+, biotin, and TPP
    b. TPP, lipoic acid and NAD+
    c. Pyridoxal phosphate, FAD and lipoic acid
    d. Biotin, FAD and TPP

65. Glycine and proline are the most abundant amino acids in the structure of
    a. Hemoglobin
    b. Myoglobin
    c. Insulin
    d. Collagen

66. Which of the following products is obtained when the peptide P-S-T-W-M-R is treated with CNBr?
    a.   P-S-T-W-M and R
    b.   P, S-T and W-M-R
    c.   P-S-T-W and M-R
    d.   P and S-T-W-M, R

67. The precursor of the prostaglandins is
    a.   Palmitic acid
    b.   Linolenic acid
    c.   Oleic acid
    d.   Arachidonic acid

68. Name the type of culture which is prepared by inoculating directly from the tissue of an organism to culture media?
    a.   Primary cell culture
    b.   Secondary cell culture
    c.   Cell lines
    d.   Transformed cell culture

69. Thayer-Martin and Martin-Lewis media are used to isolate and identify
    a.   *E. coli*
    b.   *Mycobacteria*
    c.   *Neisseria*
    d.   *Salmonella*

70. Very low dose of antigen may induce
    a.   hypersensitivity
    b.   immunological ignorance
    c.   low zone tolerance
    d.   low zone immunity

71. Polymers of N-acetylglucosamine and N-acetylmuramic acid are found in which of the following structures?
    a.   Teichoic acid
    b.   Cell wall
    c.   Glycocalyx
    d.   Lipopolysaccharide

72. Which of the following immunoglobulins are secretory and present in the milk?
    a.   IgG
    b.   IgM
    c.   IgE
    d.   IgA

73. The specificity of an antibody is due to
    a.   Its valence
    b.   The heavy chains
    c.   The Fc portion of the molecule
    d.   The variable portion of the heavy and light chain

74. A positive tuberculin test is an example of
    a.   Delayed type hypersensitivity
    b.   Acute contact dermatitis
    c.   Type I hypersensitivity
    d.   Eczema

75. Which of the following is an NOT an example of adjuvant accepted for human use?
    a.   Magnesium hydroxide
    b.   Aluminium hydroxide
    c.   Aluminum phosphate
    d.   Calcium phosphate

76. Name the class of immunoglobulin which takes part in hypersensitivity reaction?
    a.   IgG
    b.   IgE
    c.   IgA
    d.   IgM

77. The class of antibodies, which can cross the placenta is
    a.   IgD
    b.   IgA
    c.   IgG
    d.   IgM

78. What is a cell line?
    a. Multilayer culture
    b. Transformed cells
    c. Multiple growth of cells
    d. Sub culturing of primary culture

79. Bacteria capable of growth in a high salt concentration are best isolated in which of the following media?
    a. Minimal growth media
    b. Complex growth media
    c. Differential growth media
    d. Selective growth media

80. Which one of the following peroral dosage forms is likely to exhibit the longest lag time?
    a. delayed-release tablet
    b. enteric-coated tablet
    c. osmotic tablet
    d. sustained-release capsule

81. The ratio of oil, water and gum added for primary emulsion in dry gum method is
    a. 4 : 2 : 1
    b. 3 : 2 : 1
    c. 2 : 2 : 1
    d. 4 : 3 : 2

82. The molal elevation constant of water is $-1.86°C$. The decrease in freezing point of a solution containing 50 g dextrose in 1000 mL of water is
    a. $-2.6°C$
    b. $-5.2°C$
    c. $-0.26°C$
    d. $-0.52°C$

83. Which of the following has negative heat of solution?
    a. Sorbitol
    b. Mannitol
    c. Xylitol
    d. Glucitol

84. For a surfactant to be a wetting agent it should
    a. exhibit a large contact angle
    b. have HLB of $6 - 9$
    c. have high lipid solubility
    d. have high molecular weight

85. A drug powder was poured through the funnel and formed a cone 1.5 cm high and 9 cm in diameter. The angle of repose is
    a. 30°
    b. 45°
    c. 60°
    d. 15°

86. Method of choice for mixing solids capable of forming eutectic mixtures is
    a. Tumbling
    b. Spatulation
    c. Trituration
    d. Sifting

87. The dissolution rate of drugs from tablets may be increased by
    a. Increasing the compression stress during tableting
    b. Increasing the concentration of lubricants
    c. Increasing the concentration of disintegrants
    d. Film coating with ethylcellulose

88. Glossant used for tablet coating is
    a. Cetostearyl alcohol
    b. Beeswax
    c. White soft paraffin
    d. Polyvinyl alcohol

89. Which of the following is not suitable as liquid fills for hand gelatin capsules?
    a. Polyethylene glycol
    b. Arachis oil
    c. Fatty acid esters
    d. Purified water

90. Which of the following is not a property of flocculated suspension?
    a. A low sedimentation volume
    b. A high degree of flocculation
    c. A high rate of sedimentation
    d. Homogeneity of drug concentration per unit dose

91. For a drug to be intravenously injected the osmolality should be adjusted to
    a. 100 mOsm
    b. 200 mOsm
    c. 300 mOsm
    d. 400 mOsm

92. Which mass number of nuclei are NMR active?
    a. Odd
    b. Even
    c. High
    d. Low

93. The ratio between the nuclear magnetic moment and angular moment is called
    a. Magnetogyric ratio
    b. Precessional movement
    c. Gyromateric ratio
    d. Rotational movement

94. What is length in cm of sample holder in NMR?
    a. 30
    b. 25
    c. 20
    d. 35

95. Which part is used to measure unabsorbed radio frequency in NMR?
    a. RF receiver
    b. Magnet
    c. Sample Holder
    d. Recorder

96. Which solvent is used in NMR?
    a. Water
    b. Chloroform
    c. Benzene
    d. Dinitro benzene

97. In normal phase chromatography, Which compound is held by stationary phase?
    a. Polar compound
    b. Non polar compound
    c. Saturated compounds
    d. Coloured compounds

98. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?
    a. Column chromatography
    b. Planar chromatography
    c. Liquid chromatography
    d. Gas chromatography

99. Which of the following cannot be used as an adsorbent in Column adsorption chromatography?
    a. Magnesium oxide
    b. Silica gel
    c. Activated alumina
    d. Potassium permanganate

100. Thermospray is used as an interface in
    a. GC-MS
    b. HPLC-MS
    c. GC-FTIR
    d. HPLC-FTIR

101. Which of the following main components of mass spectroscopy deal with resolving the ions into their characteristics mass components according to their mass-to-charge ratio?
    a. Ion Source
    b. Analyzer
    c. Detector System
    d. Analyzer tube

102. Which type of ionic species are allowed to pass through the slit and reach the collecting plate?
    a. Negative ions of all masses
    b. Positive ions of the specific mass
    c. Negative ions of the specific mass
    d. Positive ions of all masses

103. In a time-of-flight mass spectrometer, the velocity v of an accelerated ion is related to its mass by which of the following?
    a. proportional to its mass
    b. inversely proportional to its mass
    c. proportional to the square root of its mass
    d. inversely proportional to the square root of its mass

NG 23 (GROUP B)

104. Calcium channel blockers can be divided into three class based on their chemical structure. Which of the following is not a class of calcium channel blockers?
    a. Nitrates
    b. Penylalkylamines
    c. Dihydropyridines
    d. Benzothiazepine

105. Which of following is having a xylidine moiety?
    a. Lidocaine
    b. Phenytoin
    c. Aspirin
    d. Benzocaine

106. Metformin belongs to which of the chemical class of anti-diabetic drug?
    a. Biguanides
    b. Thiazolidinediones
    c. Sulfonylureas
    d. Alpha-glucosidase inhibitor

107. Which of following hypoglycemic agent is thiazolidinedione derivative?
    a. Rosiglitazone
    b. Metformin
    c. Tolbutamide
    d. Miglitol

108. The active metabolite of anticancer cyclophosphamide is
    a. N-hydroxy cyclophosphamide
    b. N-methyl cyclophosphamide
    c. N-acetyl cyclophosphamide
    d. N-propyl cycloposphide

109. Which of the following diuretics is metabolised into the active substance canrenone?
    a. Amiloride
    b. Spironolactone
    c. Epelerenone
    d. Furosemide

110. Which receptor does the binding of cardiac glycoside digoxin to?
    a. ATP-dependent K^+ channel
    b. Na^+/K^+ antiporter
    c. ATP-dependent Ca^{2+} channel
    d. Na^+ /Ca^{2+} antiporter

111. Which of the following drugs requires o-nitro benzaldehyde as the starting material?
    a. Amlodipine
    b. Nifedipine
    c. Nicardipine
    d. Piperin

112. Enzyme on which imatinib acts is
    a. Histone Deacetylase
    b. DHFR
    c. Tyrosine kinase
    d. Thymidylate synthase

113. H_2 receptor antagonists containing thiazole ring is
    a. Famotidine
    b. Cimetidine
    c. Ranitidine
    d. Lafutidine

114. Furosemide is
    a. Phenoxy acetic derivative
    b. Anthranilic acid derivative
    c. Propionic acid derivative
    d. Acetic acid derivative

115. Thymidine, Trityl chloride and methyl sulfonyl chloride are starting materials for synthesis of
    a. Chlorambucil
    b. Cyclophosphamide
    c. Zidovudine
    d. Acetohexamide

_____

56. The length of an elastic string is a meter when the tension is 4 newton and b meter when the tension is 5 newton. The length in meters when the tension is 9 newton is

    a. 4a – 5b

    b. 5b – 4a

    c. 9b – 9a

    d. a + b

57. Starting from rest, a particle rotates in a circle of radius $R = \sqrt{2}$ m with an angular acceleration $\alpha = (\pi/4)\, rad/s^2$. The magnitude of average velocity of the particle over the time it rotates quarter circle is

    a. 1.5 m/s

    b. 1.0 m/s

    c. 2.0 m/s

    d. 1.25 m/s

58. First law of thermodynamics is a special case of

    a. Law of conservation of energy

    b. Charles' law

    c. Law of conservation of mass

    d. Boyle's law

59. If a pendulum, which gives correct time beats seconds on ground at a certain place, is moved to the top of a tower 320 in high, the loss of time of the pendulum clock in one day in sec is

    a. 2.16 sec

    b. 1.08 sec

    c. 0.54 sec

    d. 4.32 sec

60. A wire 3 m in length and 1 mm in diameter at 30^0 C is kept in a low temperature at -170^0 C and is stretched by hanging a weight of 10 kg at one end. This change in length of the wire is [$Y = 2 \times 10^{11} N/m^2, g = 10 m/s^2$ and $\alpha = 1.2 \times 10^{-5} I^0 C$]

    a. 5.04 mm

    b. 2.5 mm

    c. 52 mm

    d. 25 mm

61. Reverberation time in a cinema theatre when it is empty is

    a. 1 second

    b. 1 to 2 seconds

    c. 3 seconds

    d. Above 5 second

62. A bimetallic strip is made of copper ($\alpha = 1.8 \times 10^{-5} K^{-1}$) and steel ($\alpha = 1.2 \times 10^{-5} K^{-1}$) is heated, then it

    a. bends with steel on concave side

    b. bends with copper on concave side

    c. does not expand

    d. data is insufficient

63. Hooke's law essentially defines

    a. Stress

    b. Strain

    c. yield point

    d. elastic limit

64. The Poisson ratio cannot have the value

    a. 0.7

    b. 0.2

    c. 0.1

    d. 0.5

NG 23 (GROUP B)

65. Wave nature of the light is evidenced by

   a. Photoelectric effect

   b. interference

   c. Black body radiation

   d. Nuclear emission

66. In glass, which colour of the visible spectrum has the smallest critical angle for total internal reflection?

   a. Violet

   b. Red

   c. Green

   d. Yellow

67. A thick rope of rubber of density 1.5×10^3 kg/m^3 and Young's modulus 5×10^6 N/m^2, 8 m in length is hung from the ceiling of a room. The increase in its length due to its own weight is (g = 10 m/s^2)

   a. 9.6×10^{-2} m

   b. 9.6×10^{-7} m

   c. 9.6×10^{2} m

   d. 9.6 m

68. Two sources are said to be coherent if they produce waves of

   a. equal wavelength

   b. equal velocity

   c. having constant phase difference

   d. having some shape of wave front

69. The bending of light rays round the corners of an obstacle is called

   a. Interference

   b. diffraction

   c. dispersion

   d. polarisation

70. A pendulum bob of mass 80 mg carrying a charge of $2 \times 10^{-8} C$ is at rest in uniform horizontal electric field (E) = 20,000 V/m. Find the tension in the thread of the pendulum and the angle it makes with the vertical

   a. $9°1'$, 2.2×10^{-4} N

   b. $18°2'$, 4.4×10^{-4} N

   c. $27°3'$, 6.6×10^{-4} N

   d. $27°3'$, 8.8×10^{-4} N

71. A capacitor of capacitance 1 μ F withstands a maximum voltage of 6 k V, while another capacitor of capacitance 2 μ F, the maximum voltage 4 k V. If they are connected in series, the combination can withstand a maximum of

   a. 6 k V

   b. 4 k V

   c. 10 k V

   d. 9 k V

72. Capacity of an isolated sphere is increased n times when it is enclosed by an earthed concentric sphere. The ratio of their radii is

   a. $\dfrac{n^2}{n-1}$

   b. $\dfrac{n}{n-1}$

   c. $\dfrac{2n}{n+1}$

   d. $\dfrac{2n+1}{n+1}$

73. The wire of the electric fire element glows red hot but the copper wire in the leads from the plug remains cool, although the same current is passing through each. This is because the element wire

   a. is longer than the copper wire

   b. has much higher resistance than the copper wire

   c. is coiled but the copper wire is not

   d. has a much lower resistance than the copper wire

74. A potentiometer wire has a resistance of 4 ohm and is connected to a cell of steady e.m.f. 2 volt and internal resistance 1 ohm. This potentiometer can measure a maximum voltage of
    a. 2.0 V
    b. 1.9 V
    c. 1.6 V
    d. 1.0 V

75. An iron rod of cross-sectional area is 4 cm^2 placed with its length parallel to a magnetic field of intensity 1600 amp/m. The flux through the rod is 4×10^{-4} weber. What is the permeability of the material of the rod? (In weber/amp-m)
    a. 0.625
    b. 6.25
    c. 0.625×10^{-3}
    d. 2.3

76. An electron moving in a uniform magnetic field of induction of intensity B, has its radius directly proportional to
    a. Its charge
    b. Magnetic field
    c. speed
    d. size

77. Velocity of matter wave is always
    a. slower than velocity of light
    b. equal to velocity of light
    c. greater than velocity of light
    d. constant

78. The velocity of a helium nucleus travelling in a curved path in the magnetic field is v. The velocity of a proton moving in the same curved path in the same magnetic field is
    a. $4\ v$
    b. $2\ v$
    c. v
    d. $v/2$

79. Magnetic moment due to the motion of the electron in the nth energy state of hydrogen atom is proportional to
    a. n
    b. n^0
    c. n^5
    d. n^3

80. The mass of an atomic nucleus is less than the sum of the masses of its constituents. The mass defect is
    a. wasted
    b. converted into heat energy
    c. converted into energy which binds the nucleons together
    d. converted into electric energy

81. deBroglie wavelength associated with a material particle is
    a. inversely proportional to momentum
    b. inversely proportional to its energy
    c. directly proportional to momentum
    d. directly proportional to its energy

82. Which of the following elements has the lowest first ionization energy?
    a. Al
    b. Si
    c. B
    d. C

83. In nuclear physics liquid drop model explains
    a. Gamma ray emission
    b. Alpha particle emission
    c. Beta particle emission
    d. Nuclear fission

84. The Miller indices of a plane which cuts the intercepts of 2, 3 and 4 units along the three aces, respectively are

    a. (6 4 3)

    b. (2 3 4)

    c. (3 2 1)

    d. (2 3 2)

85. The packing density of BCC is

    a. 52%

    b. 74%

    c. 68%

    d. 34%

86. The work done by a cantilever beam is given by the following expression

    a. Work done = $\frac{1}{2} \times$ stress $\times$ strain

    b. Work done = $\frac{1}{2} \times$ stress $\times$ volume

    c. Work done = $\frac{1}{2} \times$ strain $\times$ volume

    d. Work done = $\frac{1}{2} \times$ stress $\times$ strain $\times$ volume

87. The battery connections required to forward bias a pn junction are

    a. +ve terminal to p and –ve terminal to n

    b. -ve terminal to p and +ve terminal to n

    c. -ve terminal to p and –ve terminal to n

    d. +ve terminal to p and +ve terminal to n

88. If the Hall coefficient is negative then the semiconductor is

    a. p - type

    b. instrinic

    c. n - type

    d. extrinsic

89. The wavelength of radiation emitted by an LED made up of a semiconducting material with band gap energy 2.8 eV is

    a. 2.8 A°

    b. 4.9308 A°

    c. 5548.4 A°

    d. 4430.8 A°

90. At 0 K semiconductor acts as

    a. A super conductor

    b. A good conductor

    c. An insulator

    d. Same as semiconductor

91. Negative feedback is employed in

    a. Oscillators

    b. Rectifiers

    c. Amplifiers

    d. Receivers

92. The classical free electron theory was developed by

    a. Sommerfeld

    b. Bloch

    c. Drude and Lorentz

    d. Planck

93. Pure metals like nickel and aluminium are used as cathode materials in Photoemissive cells for

    a. Infrared radiation

    b. Visible light

    c. Ultra violet radiation

    d. radiowaves

94. The number of degree of freedom for a diatomic gas is

    a. 6

    b. 5

    c. 4

    d. 3

NG 23 (GROUP B)

95. The mass of an electron varies with variation in
    a. Electrostatic field
    b. Magnetic field
    c. Gravitational field
    d. Speed

96. Which of the following is the heaviest?
    a. Molecule
    b. Atom
    c. Electron
    d. Proton

97. An atom in a crystal vibrates at a frequency determined by
    a. the stiffness of the bond it makes with its neighbours
    b. the temperature of the crystal
    c. the heat content of the crystal
    d. the atomic number of the metal

98. Which of the following is not electromagnetic in nature?
    a. Cathode rays
    b. X-rays
    c. Gamma rays
    d. Infrared rays

99. At normal temperature, the polarizations which are independent of temperature are
    a. Electronic and ionic
    b. Ionic and orientational
    c. Orientational and space charge
    d. Space charge and electronic

100. The property of becoming electrically polarized when mechanical stress is applied is known as
    a. Ferro–electric
    b. Piezoelectric
    c. Pyro electric
    d. Electro–optic

101. Diamagnetic susceptibility is
    a. Large, negative
    b. Small, positive
    c. Small, negative
    d. Large, positive

102. Ferrox cube is the commercial name of
    a. Ferromagnetic materials
    b. Paramagnetic materials
    c. Ferrimagnetic materials
    d. Diamagnetic materials

103. $\dfrac{\epsilon_r - 1}{\epsilon_r + 2} = \dfrac{N\alpha}{3\epsilon_0}$ is
    a. Lorentz relation
    b. Clausius–Mosotti relation
    c. Einstein relation
    d. Curie

104. In a dielectric the power loss is proportional to
    a. ω
    b. ω^2
    c. $1/\omega$
    d. $1/\omega^2$

105. Below transition temperature, a superconducting material exhibits
    a. Only zero resistance
    b. Only diamagnetic property
    c. Zero resistance and diamagnetism
    d. Zero resistance and ferromagnetism

NG 23 (GROUP B)

106. The transition temperature of most low temperature superconducting elements is in the range

    a.   Zero to 10 K

    b.   10 K to 20 K

    c.   20 K to 50 K

    d.   Above 50 K

107. Superconductivity results due to

    a.   All electrons having Fermi energy at 0 K

    b.   Crystal structure having no atomic vibrations at 0 K

    c.   All electrons interacting in the super conducting state

    d.   Crystals structure having infinite atomic vibrations at 0 K

108. A superconducting material on being subjected to critical field changes to

    a.   Normal state

    b.   Critical conductivity

    c.   Superconductivity which is independent of temperature

    d.   Remains uninfluenced

109. Superconductors are popularly used for

    a.   Generating very strong magnetic field

    b.   Reducing I^2R losses

    c.   Generating electrostatic field

    d.   Generating regions free from magnetic field

110. Nano crystalline materials synthesised by sol-gel technique results in a foam like structures called

    a.   Gel

    b.   Aerosol

    c.   Aerogel

    d.   Foam

111. Which nanomaterial is used for cutting tools?

    a.   Fullerene

    b.   Tungsten Carbide

    c.   Gold

    d.   Aerogel

112. A Carbon monoxide sensor made of zirconia uses which characteristic to detect any change?

    a.   Capacitance

    b.   Resistivity

    c.   Permeability

    d.   Chemical Activity

113. Which components of an automobile are envisioned to be coated with zirconia?

    a.   Spark plugs

    b.   Tyres

    c.   Liners

    d.   Brakes

114. The main purpose of CNTs in fuel cells is

    a.   Production of energy

    b.   Active medium

    c.   Storage

    d.   Catalyst

115. Nanoscale aluminium oxide increases the

    a.   Conductivity

    b.   Ductility

    c.   Resistance

    d.   Stability

———————

22 — PRINTING TECHNOLOGY

(Answer ALL questions)

56. An element of art that refers to the lightness or darkness of a color is a
    a. Value
    b. Form
    c. Space
    d. Intensity

57. Which of the following helps to diagnose problems with DTP documents or pdf files?
    a. Preflighting software
    b. Illustrating software
    c. Word-processing software
    d. Trapping Software

58. Is a graphic data file stored as outline based data?
    a. .png
    b. .bmp
    c. .eps
    d. .gif

59. Which gives the nonprinting areas storage-resistant hydrophilic properties?
    a. IPA
    b. Fountain solution
    c. Gum arabic
    d. Antimicrobial additive

60. Which of the following metals is not used in gravure cylinder making process?
    a. Copper
    b. Chrome
    c. Nickel
    d. Manganese

61. In offset printing the dotgain will be maximum in
    a. Highlight
    b. Shadow
    c. Midtone
    d. Uniform in all tonal regions

62. In the visual reference test element in UGRA FOGRA digital plate wedge, under theoretical ideal condition and linear tone reproduction, the two fields in _____ step should show same tone value.
    a. 30%
    b. 40%
    c. 50%
    d. 60%

63. Which of the following specifications is not recommended by ISO 12647-6?
    a. Density
    b. Hue angle
    c. Dot gain
    d. Trapping

64. The _____ imposition requires gripper margin on both leading and trailing edge.
    a. Work and turn
    b. Full Sheet
    c. Work and tumble
    d. Work and twin

65. Well formed XML document means it contains
    a. a root element
    b. an element
    c. one or more elements
    d. one or more elements and a root element must contain all other elements

66. Which of the following statements is/are not correct?
    a. Vector images can be resized, rescaled and reshaped infinitely
    b. Vector images can be magnified upto 2400% only
    c. Vector images use paths to define the graphic objects
    d. Vector images cannot be used to define photographs

67. Which of the following holds diecut pieces together as they travel through the diecutting machine?
    a. Nick
    b. Creep
    c. Edge
    d. Crossover

NG 23 (GROUP B)

68. Which of the following statements is /are not correct about offset printing?

(i) Image and non-image areas are only physically differentiated.

(ii) The readable image from plate, offsets on blanket and then on the substrate

(iii) The image area should be hydrophilic and non-image should be oleophilic.

a. Only (i) and (ii)
b. Only (i) and (iii)
c. Only (ii) and (iii)
d. All of the above

69. In continuous flow dampening systems if the metering nip rollers rotates in the same direction (clockwise or anti clockwise), then
a. The surfaces of the two rollers are travelling in the same direction at the point of contact
b. The surfaces of the two rollers are travelling in the opposite direction at the point of contact
c. The surfaces of the two rollers are travelling in the no direction at the point of contact
d. No influence at all

70. Which one of the following statements is correct?
a. The screen printing process is made up of the basic items: Stencil, Squeegee, Ink, Substrate, Machine
b. The screen-printing process is made up of the basic items: Stencil, Squeegee holder, Printer, Substrate
c. The screen-printing process is made up of the basic items: Stencil, Vacuum Bed, Ink, Substrate
d. The screen-printing process is made up of the basic items: Stencil, Squeegee Sharpener, Ink, Substrate

71. Which of the following printers utilize a dye from a page size ribbon that vaporizes and condenses on the paper?
a. Dye sublimation
b. Dye freezing
c. Dye evaporation
d. Dye saturation

72. Which one of the following statements is correct about an 8-page half sheet work?
a. 4 pages in front and 4 pages in backside of the paper is printed
b. 8 pages in front and 8 pages in backside of the paper is printed
c. 4 pages in front and 8 pages in backside of the paper is printed
d. 8 pages in front and 4 pages in backside of the paper is printed

73. Which folder controls the passage of printed sections through the fold with tapes and used to reduce the trim waste?
a. Ribbon folder
b. Kite folder
c. Pinless folder
d. Hi-tech folder

74. Find the correct statement regarding Flexography printing
a. Back exposure is done with image negative on the plate
b. Face exposure forms the floor of the plate
c. Face exposure is done with image negative on the plate.
d. Post exposure forms the relief on the plate

75. The advantages of ———— press is its ability to hold good registration when printing on thin, extendable packaging materials.
a. Stack
b. Inline
c. Common Impression
d. Variable Data

76. What is/are common limitations of Gravure press?
a. High quality color reproduction is possible on suitable substrates
b. Possible to produce continuous design without cut off gap
c. Process only viable for high run lengths
d. Low wastage and consistent quality through the run

77. Which of the following devices in the web offset machine is used to change the direction of the web?
    a. Folders
    b. Festoon
    c. Kicker
    d. Turner Bar

78. Which of the following types of blanket is used for printing on high speed machine and substrates like board and coated stock?
    a. Medium Blanket
    b. Hard Blanket
    c. Soft Blanket
    d. Sub Blankets

79. An instrument which measures the length and tack of an ink is
    a. Viscometer
    b. Inkometer
    c. Densitometer
    d. Durometer

80. The sheets are folded exactly in half each time, edge to edge is known as
    a. Fold to print
    b. Fold to machine
    c. Fold to paper
    d. Fold book

81. Ring binding is also called as
    a. Loose leaf binding
    b. Mechanical binding
    c. Perfect binding
    d. Case binding

82. Eyelets refers to
    a. Small holes made in paper
    b. Small metal units used to prevent tearing of hole in paper
    c. Small metal strips used on the spine of the book as a binding
    d. Small holes made on the spine

83. The alternative name for perfect binding is
    a. Case binding
    b. Loose leaf binding
    c. Mechanical binding
    d. Adhesive binding

84. In guillotine machine, a metal bar that runs parallel to the knife is
    a. Clamp
    b. Trimmer
    c. Cutting stick
    d. Cutting mark

85. Lamination process in which film coated with liquid adhesive, dryed and nipped with board and paper is called
    a. Dry lamination
    b. Hot lamination
    c. Film with adhesive and release paper
    d. Wet lamination

86. The size of paper used for post card
    a. A4
    b. A5
    c. A6
    d. A3

87. Checking whether all the sections of a book are in correct sequence is
    a. Gathering
    b. Collating
    c. Insetting
    d. Stitching

88. The process in which gold leaf is applied to the edges of a book
    a. Foil stamping
    b. Embossing
    c. Gilding
    d. Debossing

89. The vibrating table that squares the stack of sheets in post press operations is named as
    a. Jogger
    b. Guillotine bed
    c. Trimmer
    d. Die cutter

90. In wire stitching, ————— is used to close the stitch beneath the work.
    a. Bender
    b. Clenchers
    c. Wire straightners
    d. Wire insertner

NG 23 (GROUP B)

91. Varnish used for coating of boards used in food packaging is
    a. Spirit varnish
    b. Vineyl lacquer
    c. Aqua based varnish
    d. UV varnish

92. Aluminium collapsible tubes are produced by _____ from a small round blank.
    a. Sheet extrusion
    b. Blown film extrusion
    c. Impact extrusion
    d. Co-extrution

93. Vapour phase inhibitor is a kind of coating on paper to avoid
    a. Corrosion
    b. Oxidation
    c. Leaching
    d. Migration

94. The qualitative tests are conducted to assess the quality of packaging materials in terms of
    a. Physical properties
    b. Chemical properties
    c. Mechanical properties
    d. All of the above

95. The glass is the percentage of reflectance of light at a particular angle where the angle of incident light and the angle of reflected light will be the
    a. Same
    b. Larger
    c. Smaller
    d. Medium

96. Thermal shock test is used to determine the resistance of thermal shock of
    a. Glass container
    b. Plastic container
    c. Metal
    d. All of the above

97. Which of the following is used to determine the leakage of metal container?
    a. Hydraulic pressure
    b. Leak test
    c. Air pressure test
    d. None of the above

98. The sweeteners and ————— are added to food to minimize the spoilage action.
    a. Preservative
    b. Enzymatic
    c. Metabolic
    d. All the above

99. Which of the following properties of polymer is required for achieving good printing characteristics?
    a. Stiffness
    b. OTR
    c. WVTR
    d. Polarity

100. In the following laws which does not obey the permeation model?
    a. Henry's law
    b. Fick's law
    c. Boyle's law
    d. Planck's law

101. The reference standard for pre-shipment test is carried out by
    a. ISTA
    b. SWMA
    c. PFA
    d. SICMBA

102. Which of the following is ASTM standard for Determination of Leaks in Flexible Packaging by Bubble Emission?
    a. D6653
    b. D4991
    c. D3078
    d. None of the above

103. Which of the following chemicals is used for fumigation?
    a. Methyl bromide
    b. Potassium nitrate
    c. Ethylene-oxide
    d. Ethylene Scavenger

104. The sunk cost is also known as
    a. Prime cost
    b. Marginal cost
    c. Historical cost
    d. Retrospective cost

105. The main objective of financial management is
    a. Profit and wealth maximization
    b. Sales forecasting
    c. Financial Audit
    d. Tax compliance

106. Which of the following is the total of all direct and indirect cost?
    a. Overheads
    b. Prime cost
    c. Work cost
    d. Production cost

107. The formula for calculating the weight of a reel of paper is
    a. $WR = (GSM \times B \times L)/4000$
    b. $WR = (GSM \times B \times L)/3000$
    c. $WR = (GSM \times B \times L)/2000$
    d. $WR = (GSM \times B \times L)/1000$

108. The sum of all direct costs such as cost of production and raw materials is called as
    a. Transportation cost
    b. Conversion cost
    c. Overheads
    d. Prime cost

109. The cost of operating all the production facilities of a manufacturing unit is termed as
    a. Distribution overhead
    b. Factory overhead
    c. Office overhead
    d. Selling overhead

110. Which of the following formula is used to calculate the overheads?
    a. Overheads = IM + IL + IE
    b. Overheads = IM + IL – IE
    c. Overheads = (IM + IL) × IE
    d. Overheads = (IM + IL) / IE

111. Machine hour rate =
    a. Total factory overheads – Total machine hours
    b. Total factory overheads / Total machine hours
    c. Total factory overheads + Total machine hours
    d. Total factory overheads * Total machine hours

112. Which of the following formula may be used to calculate the requirement of adhesive?
    a. Adhesive required = (work area × no. of books)/ coverage power
    b. Adhesive required = coverage power / (work area × no. of books)
    c. Adhesive required = (work area + no. of books)/ coverage power
    d. Adhesive required = (work area – no. of books)/ coverage power

113. Which of the following is used to calculate present value?
    a. $PV = FV – 1/(1+r)t$
    b. $PV = FV + 1/(1+r)t$
    c. $PV = FV \times 1/(1+r)t$
    d. $PV = FV \times 1/(1–r)t$

114. (Current Sales Level – Breakeven Point) ÷ Current Sales Level =
    a. P/V ratio
    b. Sensitivity
    c. Breakeven point
    d. Margin of safety

115. Break–Even Point (Units) is equal to
    a. Fixed Costs × (Revenue per Unit – Variable Cost per Unit)
    b. Fixed Costs ÷ (Revenue per Unit – Variable Cost per Unit)
    c. Fixed Costs – (Revenue per Unit – Variable Cost per Unit)
    d. Fixed Costs + (Revenue per Unit – Variable Cost per Unit)

————————

23 — PRODUCTION AND INDUSTRIAL ENGINEERING

(Answer ALL questions)

56. A ball and a socket joint form a
    a. sliding pair
    b. rolling pair
    c. spherical pair
    d. turning pair

57. If two gears A and B are meshing with each other such that A rotates with 100 rpm. If $m_A = 2$ mm, $m_B = 4$ mm and $t_A = 50$, $t_b = 30$, then revolution of gear B is
    a. 60 rpm
    b. 84 rpm
    c. 100 rpm
    d. 92 rpm

58. When the body is subjected to transverse vibration, the stress induced in a body will be
    a. Shear
    b. Bending stress
    c. Compressive stress
    d. Both shear and tensile stress

59. Due to slip of belt, velocity ratio of belt drive
    a. decreases
    b. increases
    c. may increases or decreases
    d. not affected

60. In cyclic loading, stress concentration is more serious in
    a. elastic materials
    b. ductile materials
    c. brittle materials
    d. Rubber

61. What is the minimum distance should be maintained between two successive welding spots while welding using resistance spot welding process in order to avoid shunting of current with the nearby spots and contact surfaces?
    a. 16 times the thickness of parent to be welded
    b. No such minimum distance is required
    c. Equal to the thickness of parent to be welded
    d. Equal to the diameter of electrode used

62. Which one of the following is used as the pattern material in precision investment casting?
    a. Metal
    b. Wax
    c. Plastic
    d. Wood

63. Slugging is the operation of
    a. Removal of excess metal from the edge of a strip to make it suitable for drawing without wrinkling
    b. Cutting of the excess metal at edge which was required for gripping purpose during press working operation
    c. Cutting in a single line across a part of the metal strip to allow bending or forming in progressive die operation while the part remains attached to the strip
    d. Punching in which punch is stopped as soon as the metal fracture is completed and metal is not removed but held in hole

64. Which of the following displacement diagrams should be chosen for better dynamic performance of a cam-follower mechanism?
    a. simple harmonic motion
    b. parabolic motion
    c. cycloidal motion
    d. Straight line motion

65. Which of the following is true for centrifugal force causing unbalance?
    a. Direction changes with rotation
    b. Magnitude changes with rotation
    c. Direction and magnitude both change with rotation
    d. Direction and magnitude both remain unchanged with rotation

66. Which one of the following is the tool life criteria that is normally referred?
    a. Crater wear
    b. Nose radius
    c. Flank wear
    d. Crater wear and nose radius

67. In gears, the angle subtended by circular pitch at the centre of pitch circle is known as:
    a. Rack angle
    b. Pitch angle
    c. Addendum angle
    d. Helix angle

68. If a shaper has a stroke length of 240 mm and number of double strokes per minute is 40 and ratio of return to cutting time is 2 : 3, then its cutting speed is
    a. 15.9 m/min
    b. 25.6 m/min
    c. 3.7 m/min
    d. 18.4 m/min

69. Which principle does Tomlinson's surface meter work on?
    a. Mechanical
    b. Electrical
    c. Mechanical and Optical
    d. Carrier modulating principle

70. The way of inspection that is done using machine vision to check the correct filling of containers in a bottling line falls under which of the following types?
    a. Assembly verification
    b. Presence absence detection
    c. Dimensional gauging
    d. Defect detection

71. Increasing Silicon composition in cast iron promotes
    a. Graphitization
    b. Carbide formation
    c. Red shortness
    d. Dezincification

72. Creep rate in ternary stage
    a. Decreases
    b. Constant
    c. Increases
    d. Increase and then decrease

73. The following structure is obtained by austempering process of heat treatment
    a. Ferrite
    b. Pearlite
    c. Bainite
    d. Leduburite

74. Case hardening is the method for hardening
    a. Tungsten carbide
    b. High carbon steel
    c. Silicon carbine
    d. Low carbon steel

75. Martensite formed instantaneously at low temperature from
    a. Ferrite
    b. Cementite
    c. Austenite
    d. Pearlite

76. A device, which holds, locates a workpiece, guides and controls one or more cutting tools is called as
    a. Jig
    b. Fixture
    c. Template
    d. Lathe

NG 23 (GROUP B)

77. What is the drilling time for producing a hole in an MS sheet of 25 mm thickness using an HSS drill of 20 mm diameter? The cutting speed and feed for drill are 20 m/min and 0.25mm/rev respectively. Neglect time taken for setting up, approaching and travelling of tools.
    a. 0.314 min
    b. 0.236 min
    c. 0.438 min
    d. 0.443 min

78. A machine was purchased for Rs.10,00,000. It was assumed that after 15 years its value will reduce to Rs.3,00,000. Machine was assumed working 10 hrs/ day.
    Calculate the depreciation /working hr.
    a. Rs.100
    b. Rs.2
    c. Rs.19
    d. Rs.51

79. Master schedule is prepared for
    a. Single product continuous production
    b. Multi product batch production
    c. Assembly product continuous production
    d. Single product batch production

80. In which of the following type of die, a combination of cutting and some other operation can be performed at a single station?
    a. Cutting die
    b. Forming die
    c. Compound die
    d. Combination die

81. Which of the following is a CAD neutral file format?
    a. SLDPRT
    b. CATPRT
    c. PRT
    d. STEP

82. Select CNC programing code for rapid traverse motion.
    a. G00
    b. G01
    c. G02
    d. M00

83. In which of the following processes filament is fed into an extrusion head and heated to a semi-liquid state and deposited in thin layers based on slice data?
    a. SLS
    b. FDM
    c. SGC
    d. SLA

84. A Cartesian robot has ——————— movement.
    a. Two linear one rotational
    b. Three rotational
    c. Two rotational and one linear
    d. Three linear

85. Flexible Manufacturing Systems (FMS) allows to
    a. Only manage the movement of products, parts or trolley
    b. Only manage the movement of materials or workpiece between operations
    c. Completely manufacture a range of components without significant human intervention during the processing
    d. Co-ordinate the entire process of manufacturing and manufactures a part or a component or a product with a dedicated layout

86. A farm machinery manufacturer has an output rate of 320 hours per week and has measured the load on his shop as follows:
    Work in process:
    Current requirement – 960 hours
    Long term orders – 320 hours
    Then what is the manufacture lead time?
    a. 4 weeks
    b. 6 weeks
    c. 15 weeks
    d. 3 weeks

87. In Materials Requirement Planning, if the inventory holding cost is very high and the setup cost is zero, which one of the following lot sizing approaches should be used?
   a. Economic Order Quantity
   b. Lot-for-Lot
   c. Base Stock Level
   d. Fixed Period Quantity, for 2 periods

88. The demand for a two-wheeler was 900 units and 1030 units in April 2015 and May 2015, respectively. The forecast for the month of April 2015 was 850 units. Considering a smoothing constant of 0.6, the forecast for the month of June 2015 is
   a. 850 units
   b. 927 units
   c. 965 units
   d. 970 units

89. Consider the following Linear Programming problem (LPP).
   Maximise $Z = X_1 + 2X_2$
   Subject to:
   $X_1 \leq 2$
   $X_2 \leq 2$
   $X_1 + X_2 \leq 2$
   $X_1, X_2 \geq 0$ (i.e. +ve decision variables)
   What is the optional solution to the above LPP?
   a. 2, 2
   b. 0, 2
   c. 2, 0
   d. 0, 0

90. Which one of the following is **NOT** a decision taken during the aggregate production planning stage?
   a. Scheduling of machines
   b. Amount of labour to be committed
   c. Rate at which production should happen
   d. Inventory to be carried forward

91. Performance efficiency is calculated using the equation:
   a. E = (C × N) / T × 100
   b. E = T/ (C × N) × 100
   c. E = T/ (Q × N) × 100
   d. E = (Q × N) / T × 100

92. The possibility of concluding that the process is in – control when it is actually out – of - control is called as
   a. Producer's risk
   b. Consumer's risk
   c. Type III error
   d. Type IV error

93. The process capability ratio Cr is
   a. $1 / C_{pk}$
   b. $1 / C_{pu}$
   c. $1 / C_{pl}$
   d. $1 / C_p$

94. A washing machine reported 6 failures during a period of 1500 hours of operation. The average repair time per failure is 1 hour. The failure rate λ is
   a. 0.00604 per hour
   b. 0.00204 per hour
   c. 0.00402 per hour
   d. 0.00804 per hour

95. Which of the following charts are drawn when sub group consists of n units?
   a. C chart
   b. U chart
   c. R chart
   d. np chart

96. If the value of the objective function Z can be increased or decreased indefinitely, such a solution is called
   a. Bounded solution
   b. Unbounded solution
   c. Unique solution
   d. Multiple solutions

97. For a minimization problem, the objective function coefficient for an artificial variable is
   a. + M
   b. –M
   c. Zero
   d. –1000

98. A minimization problem can be converted into a maximization problem by changing the sign of coefficients in the
   a. Constraints
   b. Objective Functions
   c. Both (a) and (b)
   d. Only default constraints

99. If there were n workers & n jobs there would be
   a. n! solutions
   b. (n–1)! solutions
   c. (n!)solutions
   d. n solutions

100. ABC classification is based on
   a. Henry Mintzberg's Principle
   b. Pareto's Principle
   c. Availability of Materials
   d. Simplex principle

101. Economic order quantity is the quantity of material when the
   a. Inventory carrying cost = Inventory ordering cost
   b. Order quantity is matching to demand quantity
   c. Order quantity is equal to available cash
   d. Order quantity is economical

102. A queuing system is said to be a ——————— when its operating characteristic is independent upon time
   a. pure birth model
   b. pure death model
   c. transient state
   d. steady-state

103. Which of the following cannot improve productivity?
   a. Decreasing Input and maintaining the same output
   b. Increasing Output and maintaining the same input
   c. Increasing Input and maintaining the same output
   d. Proportionately increasing the output to lesser input

104. What does the symbol 'O' imply in work-study?
   a. Operation
   b. Inspection
   c. Transport
   d. Delay/temporary storage

105. The height of the top of the workbench should be ————————— the height of the elbow of the workmen.
   a. At
   b. Above
   c. Below
   d. Any of the above

106. If a particular job fails to meet the due date then such jobs in scheduling terminology is called
   a. Tardy Job
   b. Ready Job
   c. Work Remaining
   d. Yet to complete the job

107. SPT Rule
   a. Minimizes mean flow time
   b. Maximizes mean flow time
   c. Reduces the tardy jobs
   d. Does not affect flow time

108. Which of the following method uses the "sum of square" in its process of forecasting
   a. Moving Average Method
   b. Weighted Moving Average
   c. Naïve Approach
   d. Regression Method

109. A Continuous production line that has 3 machines with processing times as 30 min, 10 min, and 15 minutes. The management decided to add one more machine of the same capacity to the bottleneck process. What will be the production rate (in units/hr) of the system before and after adding the machine to the system?

   a. 2,1

   b. 2,4

   c. 4,2

   d. 2,6

110. Which of the following is a type of control chart for variables ?

   a. C chart

   b. P chart

   c. $\overline{X}$ chart

   d. U chart

111. When the sample size is one which type of chart do you advocate ?

   a. X-bar chart

   b. R-chart

   c. S chart

   d. MA and MR chart

112. The Aggregate Measure of the goodness of the process performance is known as

   a. Process Capability Index

   b. Upper Capability Index

   c. Lower Capability Index

   d. Capability Ratio

113. The numerical definition of a poor lot, associated with a consumer's risk is known as

   a. LQL

   b. AQL

   c. α

   d. β

114. Which one is the correct sequence for TPM, in eliminating the three types of Losses?

   a. Downtime, quality, and defect

   b. Downtime, speed, and quality

   c. Downtime, speed, and defect

   d. Downtime, speed, and quantity

115. Average uptime availability is defined as the proportion of time during which the system is available for use in a specified interval is

   a. (0,1)

   b. (0,T)

   c. (T,T)

   d. (1,T)

—————————

PART III

24 — SOCIAL SCIENCES

(Answer ALL questions)

56. Economics is the study of
    a. Production Technology
    b. Consumption decision
    c. How Society decides what, how and for whom to produce
    d. The best way to run society

57. Agglomeration economies are found in the
    a. Urban areas
    b. Rural areas
    c. MNC's
    d. Foreign Trades

58. Who is the father of classical economics?
    a. Adam Smith
    b. Henry George
    c. John Stuant Mill
    d. None of the above

59. Which of the following is not a component of the GDP?
    a. Consumption Goods
    b. Investment spending by firms in captial goods
    c. Public sectors own demand for goods.
    d. Employment rate

60. The Term "Laizzez Fare" relates to
    a. The policy by the Government in a particular direction
    b. The policy of leaving things to take their own course
    c. The policy of trading by Business men
    d. None of the above

61. Which of the following is the expansion of a country's money supply that results from banks being able to lend?
    a. Ripple Effect
    b. Keynes effect
    c. Acceleration Effect
    d. Multiplier effect

62. Which of the following statements reflects the true meaning of gross investment?
    a. Gross investment is the total of net investment and depreciation
    b. Gross investment is the difference between the net investment and depreciation
    c. Both (a) and (b) are correct
    d. Both (a) and (b) are incorrect

63. Which is not an axiom from the following?
    a. Externalities have positive effect on the economy
    b. There is no competition among firms
    c. Self-reinforcing effect causes inefficiency
    d. Production is subject to economies of scale

64. When was the Blue Revolution in India launched?
    a. During the 5th Five Year Plan
    b. During the 10th Five Year Plan
    c. During the 7th Five Year Plan
    d. During the 9th Five Year Plan

65. What is a continuous urban spread constituting a town and its adjoining outgrowths (OGs), or two or more physically contiguous towns together with or without outgrowths of such towns?
    a. Out Growths
    b. Urban Agglomeration
    c. Census Town
    d. Statutory Town

66. Which is the most important factor influencing agglomeration economics?
   a. Availability of cheap labour
   b. Availability of better infrastructure
   c. Physical proximity of other related firm
   d. Availability of Consumers

67. Immigrants affect the economy in
   a. Labour Market
   b. Public Purse
   c. Economic Growth
   d. All of the above

68. The resident in this area enjoy the urban services and facilities but usually do not pay for them.
   a. Urban Fringe
   b. Suburb
   c. Urban Sprawl
   d. None of the above

69. The focus for urban activity and the confluence of the city's transportation infrastructure is
   a. Component-Based Development
   b. Central Business District
   c. Customer Business Development
   d. Cash Before Delivery

70. The sources of agglomeration economies include
   a. Input productivity
   b. Labor mobility
   c. Capital intensity
   d. Knowledge spillover

71. In Sociology , society refers to
   a. Members of a specific in-group
   b. Pattern of the norm of interaction
   c. Congregation of people
   d. People with laws and customs

72. New Agriculture policy was started in the year of
   a. 2000
   b. 2001
   c. 2005
   d. 2010

73. Which of the following is the term used to refer the relationship between human beings and their physical environment?
   a. Human Physiology
   b. Human Ecology
   c. Human Environment
   d. None of the above

74. The term Sociology was coined by
   a. Spencer
   b. Comte
   c. C.W. Thomson
   d. Duerkheim

75. According to ————, Society is a web of social relation.
   a. Cooley
   b. Maclver
   c. Parsons
   d. Leacock

76. Right to Information Act was enacted in the year
   a. 2000
   b. 2005
   c. 2002
   d. 1999

77. The Term "Survival of the fittest "was coined by
   a. Herbert Spencer
   b. Marx
   c. Darwin
   d. Censki

NG 23 (GROUP B)

78. The Sociological meaning of social change refers to change in
    a. Society
    b. Institution
    c. Association
    d. Social Relationship

79. India recognized the population problem and adopted an official national programme in family planning in
    a. 1950
    b. 1952
    c. 1955
    d. 1975

80. Which sector of India's economy contribute the most in its GDP?
    a. Agriculture
    b. Service
    c. Industry
    d. All of the above contributes equally

81. Which one of the following is not predominantly associated with tribal economy in India?
    a. Collection of forest produce and agricultural wage work
    b. Wage work in agriculture and Animal husbandry
    c. Animal husbandry and collection of forest produce
    d. Household industry and industry wage work

82. Green Revolution is related to
    a. Agricultural growth
    b. Industrial growth
    c. Milk Production
    d. All of the above

83. Select the correct Statements

    On the issue of low status of women in Family the socialist feminists argue that gender inequality is
    i. ideologically linked to their predominant engagement with household responsibility
    ii. due to their predominant engagement with unpaid household activities
    iii. due to the low income of household
    iv. politically linked to their political passivity

    Select the correct alternative
    a. i and ii
    b. ii and iii
    c. ii and iv
    d. iii and iv

84. The average number of live – born children produced by women of child bearing age in a particular society is called
    a. Morbidity Rate
    b. Mortality Rate
    c. Fertility Rate
    d. Fecundity Rate

85. Which one of the following is not a push factor of rural to urban migration?
    a. Rural unemployment
    b. Increasing practice of dowry in rural areas
    c. Rural poverty
    d. Decline of cottage and household industry in rural areas

86. Which of the following social workers work in urban and rural areas and with international and national organization?
   a. Gerontological
   b. Correctional
   c. School
   d. Community

87. Factors indicating urbanization are
   a. Migration
   b. High Congestion
   c. Slum
   d. All of the above

88. Due to the attraction of new opportunities, people migrate to the town and it is known as
   a. Push factor of migration
   b. Pull factor of migration
   c. Poverty
   d. None of the above

89. Which is not the characteristic of urban life ?
   a. Loss of humanistic value
   b. Impersonal relationship
   c. Informal relationship
   d. Competition

90. Which service provides nutrition for the children?
   a. ICDS
   b. ICMR
   c. MCH
   d. CGHS

91. The rural-urban migration that has led to over urbanization in India after 57 years of its independence is mainly a consequence of
   a. Push factor due to poverty in rural areas
   b. Pull factor due to affluence in urban areas
   c. Both push and pull factors
   d. Push factor due to affluence in urban areas

92. Which of the following is not a social process?
   a. Accommodation
   b. Acculturation
   c. Annihilation
   d. Assimilation

93. Which of the following is not a principle of case work?
   a. Specific objectives
   b. Confidentiality
   c. Individualization
   d. Evaluation

94. Bottom-up concept related to
   a. Mega planning
   b. Macro planning
   c. Meso planning
   d. Micro planning

NG 23 (GROUP B)

95. Which article of Indian Constitution lays down the provision of free and compulsory education for children?

 a. 45

 b. 46

 c. 47

 d. 48

96. Human life is mostly influenced by

 a. Friends

 b. Family

 c. School

 d. Colleagues

97. Which one of the following is not the function of a social worker in a juvenile residential institution?

 a. Administration

 b. Maintaining case records

 c. Court hearing of cases

 d. Publishing research papers

98. Globalization is driven largely by

 a. Liberalization

 b. Privatization

 c. Human Resource

 d. Modernization

99. One of the sections of Income Tax Act that gives tax exemption to nonprofit organizations on their income is

 a. 12 A

 b. 17 B

 c. 80 G

 d. All of the above

100. Which article of the Indian Constitution provides maternity leave for women?

 a. Article 40

 b. Article 41

 c. Article 42

 d. Article 44

101. The word 'urban' is derived from

 a. Persian

 b. Roman

 c. Greek

 d. Latin

102. Which one is the early approach to study Urban Geography?

 a. Urban Morphology

 b. Positivism approach

 c. Behavioral approach

 d. Humanistic approach

103. The census of India defines an urban place with a minimum population of

 a. 5,000

 b. 10,000

 c. 15,000

 d. 20,000

104. What is the big concern for defining urban and rural areas?

 a. Income

 b. Size of population

 c. Activity

 d. All of the above

105. Developed Countries generate revenue mainly from:

    a. Agriculture Sector

    b. Industrial Sector

    c. Service Sector

    d. None of the above

106. Urbanism is mainly the study of

    a. Process of urban growth

    b. Growth of the urban population

    c. The character of city life

    d. None of the above

107. The main reason behind the rapid growth of slums in India is

    a. Economic deprivation

    b. Political Instability

    c. Rural-urban migration

    d. None of the above

108. In which Zone slum area is generally located?

    a. CBD

    b. Commuters' Zone

    c. Zone in Transition

    d. Residential Zone

109. In economic geography Isotims and Isodapanes are related to :

    a. Transport cost

    b. Retailing

    c. Barter trade

    d. None of the above

110. Which of the following refers to number of people in an urban area per sq km?
    a. Citification
    b. Urban population
    c. Urban density
    d. Urbanism

111. Conurbation means
    a. Cluster of cities and town
    b. Cities of cities
    c. Group of slums
    d. None of the above

112. The year in which Burgress and Park developed their theory of urban ecology?
    a. 1925
    b. 1935
    c. 1915
    d. None of the above

113. Which of the following the term is used to refer the relationship between human beings and their natural, social and built environment?
    a. Human physiology
    b. Human ecology
    c. Human environment
    d. None of the above

114. Which of the following towns is situated on the bank of Indus river?
    a. Ropar
    b. Harappa
    c. Dholvira
    d. Mohanjodaro

115. Two towns located on both sides of a river banks is known as —————
    a. Plain Town
    b. Mountain Town
    c. Twin Town
    d. Lake Town

—————————

NG 23 (GROUP B)

25 — TEXTILE TECHNOLOGY

(Answer ALL questions)

56. Monomer(s) used for manufacturing nylon 6 is (are)
    a. hexamethylene diamine and adipic acid
    b. hexamethylene diamine and sebasic acid
    c. ethylene glycol and terephthalic acid
    d. Caprolactum

57. Which of the following techniques would provide an accurate measurement of crystallinity in a semi-crystalline fibre?
    a. Density measurement
    b. Differential Scanning Calorimetry (DSC)
    c. Wide angle X-ray diffraction
    d. Infrared spectroscopy

58. The molecular chains of liquid crystalline polymer is
    a. isotropic in nature
    b. crystalline in nature
    c. anisotropic in nature
    d. amorphous in nature

59. In melt spinning, the speed of high speed spinning process is
    a. 600 – 1500 mpm
    b. More than 6000 mpm
    c. 3000 – 4000 mpm
    d. 5000 – 6000 mpm

60. For a typical polymer fluid, pseudo plastic means
    a. The viscosity decreases with decreasing shear rate
    b. The viscosity increases with decreasing shear rate
    c. The viscosity decreases with increasing shear rate
    d. The viscosity increases with increasing shear rate

61. The influence of benzene ring in a fibre is to
    a. reduce tensile strength
    b. give firmness to the structure
    c. increase the dye uptake
    d. increase the elongation

62. In non crystalline region of cellulose, the type of bond formed is
    a. Vander Waals forces
    b. Hydrogen bonds
    c. Ionic bonds
    d. Covalent bonds

63. The range of spiral angle of S_2 layer in cotton fibre is
    a. 20 -23°
    b. 27 -33°
    c. 45°
    d. 60°

64. Which one of the following is a uni-cellular fibre?
    a. Flax
    b. Jute
    c. Raw silk
    d. Cotton

65. Which one of the following is chemically modified cellulose?
    a. Viscose rayon
    b. Cuprammonium rayon
    c. Cellulose acetate
    d. Casein

66. Which one of the following is responsible for the crimped configuration of wool fibre?
   a. medulla
   b. α and β keratin
   c. macro fibrils
   d. scales

67. Electron microscopy is used to
   a. Determine the molecular orientation
   b. Determine the crystallinity of fibres
   c. Analyse the surface morphology of fibres
   d. Analyse the lamellar structure

68. The comber noil index in the comber determines the distance between
   a. Top comb and combing cylinder
   b. Wire points on the combing cylinder and bottom nipper plate
   c. Nipping point of nipper plates and detaching roller
   d. Detaching roller and combing cylinder

69. The overall cleaning efficiency (%) of the blow room line having 2 machines with individual cleaning efficiency of m1% and m2% is
   a. $[1-\{(1-(m1/100))*$
      $(1-(m2/100))\}]*100$
   b. $[(1-(m1/100))*$
      $(1-(m2/100))]*100$
   c. $[1-\{(m1/100)*$
      $(m2/100)\}]*100$
   d. $[(m1/100)*$
      $(m2/100)]*100$

70. The hank of sliver fed to a draw frame is X Tex. Six slivers are fed and break draft of Y1 and main zone draft of Y2 are applied. If the resultant linear density (Tex) of the feed sliver increases by Z% and if the break draft is maintained same, the main zone draft should be ———— to get uniform output sliver in terms of linear density.
   a. Increased by Z%
   b. Decreased by Z%
   c. Increased by (X.Z/6).(Y1/Y2) %
   d. Decreased by (X.Z/6).(Y1/Y2)%

71. If the twist angle is 60 deg, the retraction of the yarn would be
   a. $\sqrt{3}/2$
   b. $1/3$
   c. $1/\sqrt{3}$
   d. $\sqrt{3}$

72. Liner density of the input material to the carding machine is 360 Ktex and that of the output sliver is 4Ktex. The waste extracted in card is 5%. What is the draft in the card?
   a. 95.5
   b. 90.5
   c. 85.5
   d. 80.5

73. The noil% removed by the comber running in backward feed can be increased by
   a. Increasing feed amount per nip movement
   b. Decreasing feed amount per nip movement
   c. Decreasing detachment distance
   d. Lifting the top comb up

74. Undrafting of roving at ring frame drafting is not due to
   a. Improper selection of break draft
   b. Improper selection of aprons
   c. Improper selection of spacer
   d. Incorrect temperature and RH at ring frame section

75. In the ring frame the spindle speed is 18000 rpm. The delivery rate is 20 m/min. Ring diameter is 40 mm. Find the traveller speed when the winding is taking place at 22 mm of ring tube.
   a. 17710 rpm
   b. 17840 rpm
   c. 18160 rpm
   d. 18290 rpm

NG 23 (GROUP B)

76. While changing the roving hank from coarser to finer at roving frame
    a. Bobbin rail / trough movement (speed) has to be increased
    b. Bobbin rail / trough movement (speed) has to be decreased
    c. Shifting of belt on the cone drum has to be increased
    d. Flyer speed has to be increased

77. Select the wrong statement with respect to the chase length of ring bobbin winding
    a. It is decided based on the ring diameter
    b. It decides the cop content
    c. It decides the traveller to be used
    d. It is controlled by builder motion cam and follower

78. While changing the count of yarn to be produced at ring frame for the same roving, which one of the following is not essentially be changed
    a. Twist per unit length of yarn
    b. Break draft
    c. Traveller number
    d. Total draft

79. The winding: binding coils ratio in ring frame cop is 2:1. The ratio of the ring rail speed during winding and binding will be
    a. 1:2
    b. 2:1
    c. 1:1
    d. 2:2

80. In a drum winding machine, the angle of wind becomes ――――――, if the package surface velocity is ―――――― and the traverse velocity is ――――――
    a. Minimum, Minimum, Maximum
    b. Minimum, Maximum, Minimum
    c. Maximum, Maximum, Minimum
    d. Maximum, Minimum, Minimum

81. A winding machine makes 8 coils on a package during the double traverse of its thread guide. Calculate its wind and traverse ratio.
    a. 4, 8
    b. 8, 4
    c. 16, 8
    d. 8, 16

82. In a conventional mechanical yarn clearer , the yarn thin place is cleared by the action of
    a. Knife
    b. External scissors
    c. Supervisor
    d. Yarn tensioner

83. Among the various size ingredients, which of the following combinations of ingredients is considered as a most important one for the reduction of loom to yarn and yarn to yarn friction.
    a. Adhesive, Lubricant
    b. Adhesive, Antistatic
    c. Lubricant, Antistatic
    d. Lubricant, Antifoaming

84. A 1000 meter warp experiences 2%, ,4% and 2% elongation during sizing. Calculate the final length of warp yarn in meter after the sizing process.
    a. 1003
    b. 1080
    c. 1082
    d. 1100

85. Which of the following selvedges is mostly preferred for shuttle-less narrow width fabrics?
    a. Tuck in selvedge
    b. Chain stitch selvedge
    c. Half cross leno selvedge
    d. Full cross leno selvedge

NG 23 (GROUP B)

114

86. In a shuttle loom, the increase in the ratio between crank radius and crank length
   a. Increases the beat-up force
   b. Increases the shed depth
   c. Increases the picking force
   d. Increases the dwell time

87. Three try motion is a device used along with
   a. Warp stop mechanism
   b. Weft stop mechanism
   c. Let off mechanism
   d. Take up mechanism

88. A positive dobby shedding mechanism can control
   a. 18 harnesses
   b. 24 harnesses
   c. 30 harnesses
   d. 36 harnesses

89. A warp is entered into a 72s Stockport reed with two ends per dent. The warp width in the reed is 44 inch but the fabric width is measured in the cloth room is 40 inch. Calculate the number of ends per inch in the cloth.
   a. 71
   b. 73
   c. 75
   d. 79

90. Which of the following is the application of Huck-a-back weaves?
   a. Towel
   b. Suiting
   c. Blouse
   d. Carpet

91. The term ' —————' is applied to cloths in which the stitching ends are interwoven in plain order with all wadding picks.
   a. Waved piques
   b. Fast back welt
   c. Crepon Bedford card
   d. Wadded Bedford cord

92. If a nylon fiber is found to have a mean fiber width of 16 µm, calculate its linear density in terms of denier, given that its density is 1.14gcm^3
   a. 2.06
   b. 1.06
   c. 3.06
   d. 4.06

93. Calculate the standard regain of a 67/33 Polyester : Cotton blended yarn
   a. 3.5%
   b. 3.073%
   c. 4.073%
   d. 3.75%

94. A fiber specimen of 200mm extended by 10% when loaded with 500CN force. The length of the specimen after removal of load was found to be 202 mm. The percentage elastic recovery of the specimen is
   a. 70
   b. 80
   c. 92
   d. 20

95. If 840 mature fibers and 160 immature fibers were found in a test specimen, the percent maturity would be
   a. 78
   b. 84
   c. 72
   d. 26

96. In visual examination method of yarn grading, for the yarn number of 65 to 120^S, the number of wraps per inch will be
   a. 20
   b. 26
   c. 38
   d. 48

NG 23 (GROUP B)

97. Calculate the twist angle of a spun cotton yarn twisted to give a twist factor of 5
    a. 29° 18'
    b. 35° 18'
    c. 32° 18'
    d. 37° 18'

98. A 2 meter length of polyester rope weighs 6 grams. Calculate its linear density in terms of Ktex
    a. 5
    b. 4
    c. 3
    d. 6

99. On Classimat the $H_1 + I_1$ faults are
    a. short thick faults
    b. long thin faults
    c. long thick faults
    d. short thin faults

100. Bursting strength of a square fabric of the same weight compared to unbalanced fabric weight produced from the same yarns will have
    a. same strength
    b. higher strength
    c. lower strength
    d. can be higher or lower

101. The resistance to fabric creasing can be obtained by
    a. decreasing the elastic modulus
    b. increasing the torsional stresses
    c. both torsion and compression
    d. increasing the elastic modulus

102. A fabric roll of 180 meter long and 48 inches wide contain the following defects 4 defects up to 3 inch, 2 defects over 3 inch but less than 6 inch, 2 defect over 6 inch but less than 9 inch, 2 defect over 9 inch. The defect points/100 sq.m is given by
    a. 11.9
    b. 10.18
    c. 15.3
    d. 7

103. Eight thread specimens were tested for single thread strength. The values of the strength in grams are given below
    150, 152, 160, 170, 172, 175, 180, 181
    Find the median value
    a. 181
    b. 152
    c. 171
    d. 161

104. The dye insoluble in water is
    a. Direct dyes
    b. Reactive dyes
    c. Acid dyes
    d. Vat dyes

105. Acid dyes are

    a.   Anionic

    b.   Cationic

    c.   Non ionic

    d.   Metameric

106. In comparision to homo bifunctional reactive dye , mono functional dyes exhibit better

    a.   exhaustion

    b.   hue

    c.   chroma

    d.   value

107. Methylene blue dye is used to estimate

    a.   Exhaustion

    b.   Carboxyl group

    c.   Aldehyde group

    d.   Degree of polymerization

108. Maximum possible crease recovery angle for a fabric is

    a.   90

    b.   120

    c.   180

    d.   360

109. Reduction of Indigo

    a.   Decreases solubility

    b.   Increases tinctorial value

    c.   Increases substantivity

    d.   Converts carbonyl groups to hydroxyl groups

110. P/N based flame retardants are most suitable for

    a.   Cotton

    b.   PAN

    c.   PP

    d.   Nylon

111. Dischargeable reactive dyes are mostly
    a.   Dichlorotrazine based
    b.   Anthraquinone based
    c.   Vinyl sulphone based
    d.   Acetyl based

112. Nersnt Isotherm best explains the dyeing of
    a.   Polyester with disperse dye
    b.   Cotton with reactive dye
    c.   Wool with acid dye
    d.   Viscose with direct dye

113. The fabric made of fibre with highest solar protection factor is
    a.   Cotton
    b.   Wool
    c.   Silk
    d.   Polyester

114. If a white discharge is required on indigoid based ground , the blocking agent should be
    a.   Cross linking agent
    b.   Water soluble cross linking agent
    c.   Water soluble
    d.   Water insoluble

115. Diammonium phosphate on heating produces
    a.   Ammonia and phosphoric acid
    b.   Nitrogen, water and phosphoric acid
    c.   Nitrogen, water and Phosphate
    d.   Ammonia, water and phosphate

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NG 23 (GROUP B)