

**COMMON P.G. ENTRANCE TEST-2022 (CPET-2022)**

Subject Code : **50**

Test Booklet No.:

Entrance Subject : **Electronic Science**

Hall Ticket No.:

**TEST BOOKLET**

Time Allowed : **90 Minutes**

Full Marks : **70**

**INSTRUCTIONS TO CANDIDATES**

1. **Please do not open this Question Booklet until asked to do so.**
2. Check the completeness of the Question Booklet immediately after opening.
3. Enter your **Hall Ticket No.** on the Test Booklet in the box provided alongside. **Do not** write anything else on the Test Booklet.
4. Fill up & darken Hall Ticket No. & Test Booklet No. in the OMR Answer Sheet as well as fill up Test Booklet Serial No. & OMR Answer Sheet Serial No. in the Attendance Sheet carefully. Wrongly filled up OMR Answer Sheets are liable for rejection.
5. Each question has four answer options marked (A), (B), (C) & (D).
6. Answers are to be marked on the Answer Sheet, which is provided separately.
7. Choose the most appropriate answer option and darken the oval completely, corresponding to (A), (B), (C) or (D) against the relevant question number.
8. Use only **Blue/Black Ball Point Pen** to darken the oval for answering.
9. Please do not darken more than one oval against any question, as scanner will read such markings as wrong answer.
10. **Each question carries equal marks. There will be no negative marking for wrong answer.**
11. **Electronic items such as calculator, mobile, etc., are not permitted inside the examination hall.**
12. Don't leave the examination hall until the test is over and permitted by the invigilator.
13. **The candidate is required to handover the original OMR sheet to the invigilator and take the question booklet along with the candidate's copy of OMR sheet after completion of the test.**
14. Sheet for rough work is appended in the Test Booklet at the end.

1. The frequency of the signal  $\sin\omega t$  is  $\omega$ , then the frequency of the signal  $\sin^2\omega t$  is:
  - (A)  $\omega$
  - (B)  $2\omega$
  - (C)  $\omega/2$
  - (D)  $\omega^2$
  
2. The curl of a position vector is:
  - (A)  $\infty$
  - (B) 1
  - (C) 0
  - (D) none of these
  
3. What is true for distortionless transmission?
  - (A) input and output wave shapes remain the same
  - (B) finite delay between input and output waves
  - (C) linear phase delay between all frequency components of the wave
  - (D) all of the above
  
4. A particular solution of the differential equation  $dy/dx=3y$ ,  $y(0) = 5.7$  is:
  - (A)  $5.7e^{3x}$
  - (B)  $5.7e^{-3x}$
  - (C) 0
  - (D) 1
  
5.  $\sum_{m=0}^{\infty} \frac{x^m}{m!} = ?$ 
  - (A)  $\ln x$
  - (B)  $\cos x$
  - (C)  $\sin x$
  - (D)  $e^x$

6. Eigenvalues of the matrix  $\begin{bmatrix} -5 & 2 \\ -7 & 4 \end{bmatrix}$  are:
- (A) 2, 3
  - (B) -2, -3
  - (C) -2, 3
  - (D) 2, -3
7. For which kind of signal we can't find Fourier Transform directly?
- (A) energy signal
  - (B) power signal
  - (C) deterministic signal
  - (D) all of the above
8. The DC value of a sine wave with peak-to-peak amplitude 2 is:
- (A) 0.707
  - (B) 1
  - (C) 1.414
  - (D) 2
9.  $\int_{-\infty}^{\infty} \delta(t) dt = ?$
- (A) 0
  - (B) 1
  - (C)  $\infty$
  - (D) none of these
10. A continuous baseband signal having bandwidth B is sampled with a sampling frequency  $f_s$  to convert it into a discrete signal. What should be the sampling criterion to be able to reconstruct the continuous signal from the discrete signal?
- (A)  $f_s \geq B$
  - (B)  $f_s \leq B$
  - (C)  $f_s \geq 2B$
  - (D)  $f_s \leq 2B$

11. Phase shift oscillators are based upon:
- (A) positive feedback
  - (B) negative feedback
  - (C) open loop
  - (D) none of these
12. A rough estimate of the bandwidth of a rectangular pulse of width  $\tau$  seconds is \_\_\_\_\_ Hz.
- (A)  $4/\tau$
  - (B)  $3/\tau$
  - (C)  $2/\tau$
  - (D)  $1/\tau$
13. The time constant of a capacitor informs how quickly a capacitor can be charged or discharged. A capacitor is usually used in the flashlight of a camera. What should be the value of the time constant of the capacitor?
- (A) small
  - (B) moderate
  - (C) large
  - (D) doesn't matter.
14. Two waves moving in opposite directions, each having the same amplitude and frequency forms a standing wave. The net transfer of energy in a standing wave is:
- (A) double of each
  - (B) same as each
  - (C) zero
  - (D) none of these
15. Any physical quantity that satisfies the wave equation exhibits a wave motion. Which of the following is correct?
- (A) time-varying electric field satisfies the wave equation
  - (B) static electric field satisfies the wave equation
  - (C) time-varying magnetic field doesn't satisfy the wave equation
  - (D) static magnetic field satisfies the wave equation

16. The unit of electron-volt can also be expressed in terms of:
- (A) joule
  - (B) coulomb
  - (C) watt
  - (D) volt
17. In a non-dispersive media:
- (A) group velocity > phase velocity
  - (B) group velocity < phase velocity
  - (C) group velocity = phase velocity
  - (D) none of these
18. Which phenomenon quantum mechanics can explain but classical mechanics can't?
- (A) Compton effect
  - (B) photoelectric effect
  - (C) blackbody radiation
  - (D) all of the above
19. A light source usually emits waves at random frequencies. A source is coherent if the frequencies of the emitted waves are nearly equal. Which of the following sources is more coherent?
- (A) LASER
  - (B) LED
  - (C) sun
  - (D) incandescent bulb
20.  $e^{j\pi/2} = ?$
- (A) j
  - (B) 1
  - (C) 0
  - (D)  $\infty$

21. The line integral of the static electric field around a closed loop is:
- (A) 1
  - (B) 0
  - (C)  $\infty$
  - (D) none of these
22. Differentiation in time domain is equivalent to multiplication by \_\_\_\_\_ in frequency domain.
- (A)  $j\omega$
  - (B)  $j2\omega$
  - (C)  $j3\omega$
  - (D)  $\omega$
23. The curl of gradient of a scalar field is:
- (A) 0
  - (B) 1
  - (C)  $\infty$
  - (D) none of these
24. The efficiency of a half-wave rectifier in percentage is:
- (A) 50
  - (B) 40.6
  - (C) 81.2
  - (D) 100
25. The acronym of LASER is “Light amplification by stimulated emission of radiation”. The LASER basically is a/an:
- (A) amplifier
  - (B) oscillator
  - (C) filter
  - (D) none of these
26. The color code of a resistor is Brown, Black, and Red. Its resistance value in  $\Omega$  is:
- (A) 100k
  - (B) 10k
  - (C) 5k
  - (D) 1k

27. The frequency of domestic electrical power supply used in India is:
- (A) 50Hz
  - (B) 60Hz
  - (C) 75Hz
  - (D) 100Hz
28. The impedance of a parallel LC circuit is:
- (A) zero at the resonant frequency
  - (B) infinity at the resonant frequency
  - (C) zero at all frequencies
  - (D) infinity at all frequencies
29. SPICE is a programming language that is used for simulating an electronic circuit before implementation. What is its acronym?
- (A) Simulation Program with Integrated Circuit Emphasis
  - (B) Simulation Program with Integrated Current Emphasis
  - (C) Simultaneous Program with Integrated Circuit Emphasis
  - (D) Simulation Photonics with Integrated Circuit Emphasis
30. What is the total phase shift requirement (in degree) around the feedback loop for a phaseshift oscillator?
- (A) 90
  - (B) 180
  - (C) 270
  - (D) 360
31. What happens to the gain of an open-loop system when it operates in closed-loop conditions with negative feedback?
- (A) increases
  - (B) decreases
  - (C) remains same
  - (D) none of these

32. If the input frequency of a half-wave rectifier is 50Hz, then the ripple frequency will be \_\_\_\_\_ Hz.
- (A) 200
  - (B) 100
  - (C) 50
  - (D) 25
33. In satellite communication, the attenuation level increases with an increase in frequency. Which of the following mechanism should be adopted in satellite communication?
- (A) downlink frequency should be larger than the uplink frequency.
  - (B) downlink frequency should be smaller than the uplink frequency.
  - (C) both should be the same
  - (D) doesn't matter
34. A power ratio of 100 in dB scale is:
- (A) 40
  - (B) 1
  - (C) 10
  - (D) 20
35. The phase difference in degree between the input and output of a common-emitter NPN transistor amplifier is:
- (A) 90
  - (B) 180
  - (C) 270
  - (D) 360
36. To obtain more gain, we cascade amplifiers. The resultant gain is equal to the multiplication of gain of individual amplifiers. The voltage gains of two amplifiers in a cascade are 10dB and 5dB. The resultant gain is:
- (A) 50dB
  - (B) 5dB
  - (C) 15dB
  - (D) 2dB



37. An RC circuit is fed by a 1V DC source. After switching on, the steady-state voltage across the capacitor in volt is:
- (A) 0
  - (B)  $1 - e^{-t/RC}$
  - (C)  $-e^{-t/RC}$
  - (D) 1
38. If  $H(s) = \frac{10}{s+5}$ , then  $h(t) = ?$
- (A)  $10e^{-5t}$
  - (B)  $10 e^{5t}$
  - (C)  $e^{-5t}$
  - (D)  $e^{5t}$
39. Which signal can best represent the “switching on” action in a circuit?
- (A) unit step
  - (B) impulse
  - (C) ramp
  - (D) paraboloid
40. When voltage sources are connected in series, voltages add. What happens to current when two current sources are connected in series?
- (A) adds
  - (B) differentiates
  - (C) multiplies
  - (D) none of these
41. The power delivered to a load by a source is equal to  $VI$  when there is no phase difference between the voltage and current. However, the presence of reactive elements introduces phase difference  $\theta$  between the voltage and current which reduces the power delivered by the source to the load. What is the formula to calculate the power delivered in case of the presence of phase difference?
- (A)  $VI\cos\theta$
  - (B)  $VI\sin\theta$
  - (C)  $VI\tan\theta$
  - (D) none of these

42. An inductor allows \_\_\_\_\_ to flow through it.
- (A) DC
  - (B) AC
  - (C) both
  - (D) none of these
43. The strength of the electric field varies inversely with the square of the distance in the case of a point charge, inversely with distance in the case of line charge distribution, and independent of distance in the case of planar charge distribution. Which type of source do you think is better for lighting a room?
- (A) point
  - (B) line
  - (C) planar
  - (D) none of these
44. Method of images is a clever trick of calculating electric field due to a charge above a conducting plane. By method of images, the field can be easily calculated by replacing the boundary with which polygon?
- (A) rectangle
  - (B) trapezoid
  - (C) square
  - (D) triangle
45. A quarter-wavelength monopole antenna is used to receive an FM signal at 100 MHz. What is the physical length of the antenna in meter?
- (A) 3
  - (B) 1.5
  - (C) 0.75
  - (D) 0.25
46. A dipole antenna is a metallic structure that is used to receive RF signals. It is made hollow to save material. Which phenomenon is responsible for this:
- (A) internal reflection
  - (B) skin effect
  - (C) refraction
  - (D) total internal reflection

47. In an inductive circuit, what happens when frequency increases?
- (A) inductance decreases
  - (B) inductance increases
  - (C) inductive reactance increases
  - (D) inductive reactance decreases
48. The electric field at the center of a uniformly charged ring is:
- (A) 0
  - (B)  $\infty$
  - (C) 1
  - (D) none of these
49. A bipolar junction transistor acts as a switch in the:
- (A) saturation region and cutoff region
  - (B) saturation region and active region
  - (C) cutoff region and active region
  - (D) active region and break down region
50. How many valence shell electrons are there in semiconductor atoms?
- (A) 16
  - (B) 8
  - (C) 4
  - (D) 2
51. In a transistor, a large current is controlled by a small voltage or current. Which among the following is a current-controlled transistor:
- (A) MOSFET
  - (B) BJT
  - (C) JFET
  - (D) none of these

52. A floating impedance element, supplied by two voltage sources connected in series, can be split into two grounded elements with corresponding impedances. Which theorem states this?
- (A) Miller's theorem
  - (B) Reciprocity Theorem
  - (C) Norton's Theorem
  - (D) Thevenin's Theorem
53. For which material the Hall coefficient is zero?
- (A) intrinsic semiconductor
  - (B) extrinsic semiconductor
  - (C) metal
  - (D) insulator
54. If the velocity of an electromagnetic wave is  $c$  in a vacuum. What will be the velocity in a medium whose dielectric constant is 4?
- (A)  $c$
  - (B)  $c/2$
  - (C)  $2c$
  - (D) none of these
55. The complete three-dimensional arrangement of particles within a crystal is known as the \_\_\_\_\_, while the smallest repeating unit in the lattice is called the \_\_\_\_\_.
- (A) unit cell, atom
  - (B) crystal structure, unit cell
  - (C) crystal structure, molecule
  - (D) lattice, element
56. A rectangular pulse in the time domain is a \_\_\_\_\_ function in the frequency domain.
- (A) rectangular
  - (B) sinc
  - (C) triangular
  - (D) constant

57. The information content of an event with a probability of occurrence 100% in bits is:
- (A) 0
  - (B) 1
  - (C)  $\infty$
  - (D) none of these
58. An AM signal is detected using an envelope detector. The carrier and modulating signal frequencies are 1MHz and 2kHz, respectively. An appropriate value for the time constant (in microseconds) of the envelope detector is:
- (A) 0.2
  - (B) 1
  - (C) 20
  - (D) none of these
59. Writing a program is easier than debugging. Which of the following programming language offers better-debugging capability?
- (A) C++
  - (B) C
  - (C) assembly Language
  - (D) machine Language
60. Usually, 1 Giga=1000Mega. In the case of computer memory, one GigaByte means:
- (A) 1000 MegaByte
  - (B) 1024 MegaByte
  - (C) 9024 MegaByte
  - (D) None of these
61. A notch, when looked at from the front, is found on ICs. The first pin of the IC is to the \_\_\_\_\_ of the notch.
- (A) left
  - (B) right
  - (C) bottom-left
  - (D) bottom-right

62. A small signal is fed to an op-amp inverting amplifier through a  $1\text{k}\Omega$  input resistor. If the resistance of the feedback resistor is  $2\text{k}\Omega$ , then the voltage gain of the amplifier is:
- (A) 2
  - (B) -2
  - (C) 1
  - (D) -1
63. Which is a programmable logic device?
- (A) CPLD
  - (B) FPGA
  - (C) PROM
  - (D) All of the above
64. For stability of a system, the poles of its transfer function should always lie in the:
- (A) left of s-plane
  - (B) right of s-plane
  - (C) both planes are allowed
  - (D) none of these
65. The Zener diode serves as a voltage regulator because it maintains a relatively constant voltage across it when \_\_\_\_\_.
- (A) forward biased
  - (B) no bias
  - (C) reverse biased
  - (D) none of these
66. The requirement for a logic gate to be able to drive many other logic gates is:
- (A) low output impedance, low input impedance
  - (B) high output impedance, high input impedance
  - (C) high output impedance, low input impedance
  - (D) low output impedance, high input impedance

67. Which gate can be called an anti-coincidence and coincidence gate, respectively?
- (A) XNOR and XOR
  - (B) AND and OR
  - (C) OR and AND
  - (D) XOR and XNOR
68. An instrument that is found at the center of a Wheatstone bridge is:
- (A) ammeter
  - (B) galvanometer
  - (C) voltmeter
  - (D) rheostat
69. The numerical aperture of an optical fiber describes:
- (A) light spreading ability
  - (B) light-collecting ability
  - (C) light output from an external shield
  - (D) light leakage ability
70. The noise figure of a device is 10dB. If the input SNR is 37dB, then the output SNR in dB is:
- (A) 3.7
  - (B) 370
  - (C) 27
  - (D) 47

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# ROUGH WORK