6. DIFFERENTIAL EQUATIONS

II. Select & write the correct alternative from the given option for each question (2 Marks)

1. Solution of the equation $x\frac{dy}{dx} = y\,logy$ is

   a) $y = ae^x$ b) $y = be^{2x}$ c) $y = be^{-2x}$ d) $y = e^{ax}$

2. Bacterial increases at the rate proportional to the number present. If original number M doubles in 3 hours, then number of bacteria will be 4M in

   a) 4 hours b) 6 hours c) 8 hours d) 10 hours

3. The general solution of $\frac{dy}{dx} = e^{-x}$ is

   a) $y = e^x + c$ b) $y = e^{-x} + c$

   c) $y = -e^{-x} + c$ d) $y = e^x + c$

4. The differential equation of $y = Ae^{5x} + Be^{-5x}$ is

   a) $\frac{d^2y}{dx^2} = 25y$ b) $\frac{d^2y}{dx^2} = -25y$

   c) $\frac{d^2y}{dx^2} = 5y$ d) $y\frac{d^2y}{dx^2} = -5y$

5. Differential equation of the function $c + 4yx = 0$ is

   a) $xy + \frac{dy}{dx} = 0$ b) $x\frac{dy}{dx} + y = 0$

   c) $\frac{dy}{dx} - 4xy = 0$ d) $x\frac{dy}{dx} + 1 = 0$

6. General solution of $y - x\frac{dy}{dx} = 0$

   a) $3logx + \frac{7}{y} = c$ *b)* $2logx + \frac{3}{y} = c$

   c) $logx - logy = logc$ *d)* $3logy + \frac{2}{x} = c$

7. The order and degree of $(\frac{dy}{dx})^3 - \frac{d^3y}{dx^3} + ye^x$ is

   a) 3 , 1 b) 1 , 3 c) 3 , 3 d) 1 , 1

8. The order and degree of $\left(1+\left(\frac{dy}{dx}\right)^3\right)^{\frac{2}{3}} = 8\frac{d^3y}{dx^3}$ are respectively

a) 3 , 1 b) 1 , 3 c) 3 , 3 d) 1 , 1

9. The solution of $\frac{dy}{dx}$=1 is

a) $x+y=c$ *b)* $xy=c$ *c)* $x^2+y^2=c$ *d)* $y-x=c$

10. The solution of $\frac{dy}{dx}+\frac{x^2}{y^2} = 0$ is

a) $x^3+y^3=7$ b) $x^2+y^2=c$ c) $x^3+y^3=c$ d) $x+y=c$

10. The integrating factor of Linear differential equation $xsinx\frac{dy}{dx}+(xcosx+sinx)y=sinx$ is ----

A)$-xsinx$ B)$xsinx$ C) e^{xsinx} D)e^{-xsinx}

11. If $\sec x+\tan x$ is I.F.of $\frac{dy}{dx}+Py=Q$ then Value of P =----

(A) A)$\tan x$ B) $-\tan x$ C)$\sec x$ D)$-\sec x$

1 (B) 2 (C) 3 (D) 4

II Answer the following 1 marks

1. Find the differential equation of family of lines making equal intercept on coordinate axes.
2. Find the general solution of $\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$
3. Form the differential equation of family of standard circle
4. State the degree of differential equation $e^{\frac{dy}{dx}}+\frac{dy}{dx}=x$
5. Write the general Solution of a differential equation $\frac{dy}{dx}+Py=Q$ Where P&Q are functions of x or Constants
6. . Write the general Solution of a differential equation $\frac{dx}{dy}+Px=Q$ Where P&Q are functions of y or Constants
7. Find I.F. of Linear differential equation $\frac{dy}{dx}+y=e^{-x}$

III. Attempt the following questions (2 marks)

1. Form the differential equation of $y=(c_1+c_2)e^x$
2. Solve the differential equation
   $\sec^2 y\tan x\,dy+\sec^2 x\tan y\,dx=0$
3. Solve the differential equation $\frac{dy}{dx}=e^{(x+y)}+x^2e^y$

4. Find the differential equation of family of all ellipse whose major axis is twice the minor axis.

IV. Attempt the following questions (3 marks)

1. Solve the differential equation $\frac{dy}{dx} + y = e^{-x}$
2. Solve the differential equation $x\frac{dy}{dx} + 2y = x^2 logx$
3. Solve $\frac{dy}{dx} = \frac{x+y+1}{x+y-1} when\ x = \frac{2}{3}, y = \frac{1}{3}$
4. Solve the differential equation $xdx + 2ydx = 0$
5. Solve the differential equation $(x^2 - yx^2)dy + (y^2 + xy^2)dx = 0$

6. Solve the following differential equation

$\frac{dy}{dx} = x^2y + y$

7. Find the differential equation by eliminating arbitrary constants from the relation $x^2 + y^2 = 2ax$
8. Find the differential equation by eliminating arbitrary constants from the relation $y = (c_1 + c_2x)e^x$
9. Verify $y=logx+c$ is the solution of differential equation

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$$

10. Solve : $\frac{dy}{dx} + \frac{2}{x}y = x^2$

11. Find I.F. of a differential equation

$\frac{dx}{dy} + \left(\frac{1}{1+y^2}\right)x = \frac{\tan^{-1}y}{1+y^2}$

12. Find I.F. of a differential equation $\frac{dy}{dx} + \left(cotx + \frac{1}{x}\right)y = \frac{1}{x}$
13. Find I.F. of a differential equation $\frac{dy}{dx} + \frac{y}{x} = x^3 - 3$

V Attempt the following questions (4 marks)

1. For the differential equation, find the particular solution
   $(x - y^2x)dx - (y + x^2y)dy = 0 \ when\ x = 2\ , y = 0$
2. Solve the differential equation $\frac{dy}{dx} + \frac{x-2y}{2x-y} = 0$

3. Find the differential equation from the relation $x^2 + 4y^2 = 4b^2$

4. If the population of a town increases at a rate proportional to the

   population at that time. If the population increases from 40 thousands to 60 thousands in 40 years, what will be the population in another 20 years?.

   (Given $\sqrt{\frac{3}{2}} = \ 1.2247$)

5. The rate of growth of bacteria is proportional to the number present. If initially, there were 1000 bacteria and the number doubles in 1 hours, find the number of bacteria after 5/2 hours. (Given $\sqrt{2} = 1.414$)

6. Solve the following differential equation

$yx\frac{dy}{dx} = x^2 + 2y^2$

7. Solve the following differential equation

$y\ logy\frac{dy}{dx} = logy - x$

8. For the differential equation, find the particular solution

$\frac{dy}{dx} = (4x + y + 1),$ when $y = 1, x = 0$

9. Solve the following differential equation

$y^2\ dx + (xy + x^2)dy = 0$

10. Solve the following differential equation

$x^2\frac{dy}{dx} = \ x^2 + xy - y^2$