

22210

11819

3 Hours / 70 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any FIVE of the following: 10
- a) If $f(x) = 3x^2 - 5x + 7$ show that $f(-1) = 3f(1)$
 - b) Define odd and even function with suitable examples.
 - c) Find $\frac{dy}{dx}$ if $y = a^x + x^a + a^a + \sqrt{x}$
 - d) Evaluate $\int \frac{1}{x^2 + 4} dx$
 - e) Evaluate $\int x \cdot e^x dx$
 - f) If $z_1 = 4 - 5i$ and $z_2 = 3 + 7i$ find $|z_1 + z_2|$.
 - g) Find the area enclosed by $y = 3x^2$, the lines $x = 1$, $x = 3$ and x -axis

P.T.O.

2. Solve any THREE of the following:**12**

- a) Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$
- b) Find $\frac{dy}{dx}$ if $x = \frac{1}{t}$ and $y = 1 - \frac{1}{t}$
- c) A bullet is fired into a mud bank and penetrates $(120t - 3600t^2)$ m. in 't' sec. after impact. Calculate maximum depth of penetration.
- d) Find radius of curvature to the curve $y = x^3$ at (2, 8)

3. Solve any THREE of the following:**12**

- a) Find equation of tangent to curve $4x^2 + 9y^2 = 40$ at (3, 2)
- b) Find $\frac{dy}{dx}$ if $y = \sec^{-1}\left[\frac{1}{4x^3 - 3x}\right]$
- c) If $y^x = e^y$ prove that $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$
- d) Evaluate $\int \frac{(x-1)e^x}{x^2 \cdot \sin^2(e^{x/x})} dx$

4. Solve any THREE of the following:**12**

- a) Evaluate $\int \frac{dx}{4\cos^2 x + 9\sin^2 x}$
- b) Evaluate $\int \frac{\log x}{x[2 + \log x][3 + \log x]} dx$
- c) Evaluate $\int_2^5 \frac{\sqrt{x}}{\sqrt{7-x} + \sqrt{x}} dx$
- d) Evaluate $\int x \cdot \tan^{-1} x \cdot dx$
- e) Evaluate $\int \frac{x}{(x+1)(x+2)} dx$

5. Solve any TWO of the following:**12**

- a) Find by integration the area between the curves $y = x^2 + 1$ and line $y = 2x + 1$
- b) Solve the following.
- (i) Verify that $y = \log x$ is a solution of differential equation
- $$x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$$
- (ii) The velocity of a particle is given by $v = t^2 - 6t + 7$. Find distance covered in 3 second. initially $x = 0$ when $t = 0$
- c) Solve the following.
- (i) Solve $(1 + x^2)dy - (1 + y^2)dx = 0$
- (ii) Solve $\frac{dy}{dx} + y \cot x = \cos x$

6. Solve any TWO of the following:**12**

- a) If $\omega_1 = \frac{-1}{2} + i\frac{\sqrt{3}}{2}$ and $\omega_2 = \frac{-1}{2} - i\frac{\sqrt{3}}{2}$ show that $\omega_1^2 = \omega_2$
- b) Find $L \left[e^3 t \cdot (t^2 + t) \right]$
- c) Find $L^{-1} \left[\frac{2s^2 - 4}{(s+1)(s-2)(s-3)} \right]$
- d) Solve differential equation using Laplace Transform.
- $$\frac{dy}{dt} + 2y = e^{-t}, \text{ given } y(0) = 2$$
