

22210

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- Instructions* – (1) All Questions are *Compulsory*.
- (2) Answer each next main Question on a new page.
- (3) Illustrate your answers with neat sketches wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) Assume suitable data, if necessary.
- (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (7) 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) Find 'a' if $f(x) = ax + 10$ and $f(1) = 13$.
- b) State whether the function $f(x) = \frac{x \cos x}{1 + \sin^2 x}$ is even or odd.
- c) Find $\frac{dy}{dx}$ if $y = x^e + e^x + e^e + \sqrt{x}$.
- d) Evaluate : $\int (e^x + x^e + e^e) dx$
- e) Evaluate : $\int \frac{\cos(\log x)}{x} dx$
- f) Find the area bounded by the curve $y = x^3$, x -axis and co-ordinates $x = 1$, $x = 3$.
- g) Separate into real and imaginary part for $\frac{1+i}{2-i}$.

P.T.O.

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

- a) Find maximum and minimum value of curve $x^3 - 9x^2 + 24x$.
- b) Find $\frac{dy}{dx}$ if $x^3 + y^3 + xy = 0$.
- c) If $x = \sec\theta + \tan\theta$ and $y = \sec\theta - \tan\theta$ then show that $\frac{dy}{dx} = \frac{-y}{x}$.
- d) Find Radius of curvatures of curve $y = e^x$ at point $[0, 1]$.

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

- a) Find the equation of tangent to the curve $y = x(x - 2)$ at the point $(2, 0)$.
- b) If $y = (\tan x)^x$ then find $\frac{dy}{dx}$.
- c) Find $\frac{dy}{dx}$ if $y = \cos^{-1}[4x^3 - 3x]$.
- d) Evaluate : $\int \frac{\cos \theta}{(2 + \sin \theta)(3 + 4 \sin \theta)} d\theta$

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

- a) Evaluate : $\int \frac{dx}{4 \cos^2 x + 9 \sin^2 x}$
- b) Evaluate : $\int \frac{dx}{5 + 4 \cos x}$
- c) Evaluate : $\int x \cdot \tan^{-1} x dx$
- d) Evaluate : $\int \frac{dx}{\sqrt{13 - 6x - x^2}}$
- e) Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\tan x}{\tan x + \cot x} dx$

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

- a) i) Evaluate : $\int_{-1}^1 \frac{1}{1+x^2} dx$
- ii) Calculate the area enclosed by curve $y^2 = x$ and $y = x$.
- b) i) Find the order and degree of differential equation

$$\frac{d^2y}{dx^2} = \sqrt[4]{1 + \left(\frac{dy}{dx}\right)^2}$$
- ii) Find integrating factor of D.E. $x \frac{dy}{dx} - y = x^2$.
- c) Solve the DE $L \frac{dI}{dt} + RI = E$, given $I = 0$ when $t = 0$ and L, E, R are constants.

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

- a) i) Express $z = \frac{-1}{2} + i \frac{\sqrt{3}}{2}$ in polar form.
- ii) Find $L\{2 + e^{-3t} + \sin 2t\}$.
- b) i) Find $\alpha^{-1} \left[\frac{6}{2S-3} \right]$
- ii) Find $\alpha^{-1} \left[\frac{3S+2}{S^2+16} \right]$
- c) Solve using Laplace transform.

$$\frac{dy}{dt} + 3y = 1 + e^t, \text{ given that } y(0) = -1.$$
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