

22201

23124

3 Hours / 70 Marks

Seat No.

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- 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) Define odd and even function with suitable example.
 - b) If $f(x) = x^2 + 6x + 10$ find $f(0) + f(2)$
 - c) Find $\frac{dy}{dx}$ if $y = x^{10} + 10^x + e^x$
 - d) Evaluate : $\int \frac{1+x-x^2}{\sqrt{x}} dx$
 - e) Evaluate : $\int \frac{dx}{1+\cos 2x}$
 - f) Find the area under the curve $y = x^2$ from $x = 0$ to $x = 3$ with x-axis.
 - g) State trapezoidal rule of numerical integration.

P.T.O.

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

- a) Find $\frac{dy}{dx}$ if $x^2 + y^2 + xy - y = 0$ at (1,2).
- b) If $x = a(\theta - \sin\theta)$ and $y = a(1 - \cos\theta)$ find $\frac{dy}{dx}$.
- c) Find the maximum and minimum value of $x^3 - 9x^2 + 24x$.
- d) Find the radius of curvature of the curve $y = x^3$ at the point (2, 8).

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

- a) Find the equation of the tangent and normal to the curve $13x^2 + 2x^2y + y^3 = 1$ at (1, - 2)
- b) Find $\frac{dy}{dx}$ if $y = \tan^{-1} \left(\frac{x}{\sqrt{1-x^2}} \right)$
- c) Find $\frac{dy}{dx}$ if $y = x^x$
- d) Evaluate : $\int \frac{\cos x \, dx}{(2 + \sin x)(3 + \sin x)}$

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

- a) Evaluate : $\int \frac{e^x(x+1)}{\cos^2(xe^x)} \, dx$
- b) Evaluate : $\int \frac{dx}{4 - 5\cos^x}$
- c) Evaluate : $\int \frac{x \cdot \sin^{-1}x}{\sqrt{1-x^2}}$
- d) Evaluate : $\int \frac{2x + 1}{(x + 1)(x + 2)(x + 3)} \, dx$
- e) Evaluate : $\int_0^{\pi/2} \frac{1}{1 + \sqrt{\tan x}} \, dx$

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

- a) Find the area bounded by the parabolas $y^2 = 9x$ and $x^2 = 9y$.
- b) Attempt the following:
- i) Verify that $y = \sin(\log x)$ is a solution of differential equation
- $$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$$
- ii) Solve : $(1 + x^2)dy - (1 + y^2)dx = 0$
- c) The velocity of a particle is given by $v = t^2 - 6t + 7$.
Find distance covered in 3 seconds.

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

- a) Attempt the following:

i) Given:

$$x : \quad 0 \quad \pi/8 \quad \pi/4$$

$$\tan x : \quad 0 \quad 0.4141 \quad 1$$

Find $\int_0^{\pi/4} f(x)dx$ using Trapezoidal rule.

ii) Evaluate : $\int_0^2 e^{-x} dx$ by using Simpson's one-third rule.

Given :

$$x \quad : \quad 0 \quad 1/2 \quad 1 \quad 3/2 \quad 2$$

$$y = e^{-x} : \quad 1 \quad 0.6064 \quad 0.3676 \quad 0.2231 \quad 0.1353$$

- b) Evaluate : $\int_{-3}^3 x^4 dx$ using Trapezoidal rule by dividing $[-3, 3]$ into seven intervals.
- c) Evaluate : $\int_0^{\pi/2} \cos x dx$ using Simpson's $(3/8)^{\text{th}}$ rule with $n = 8$.