

22224

21819

3 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

- 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) 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 $f(x) = x^3 - 5x^2 - 4x + 20$, show that $f(0) = -2f(3)$.
 - b) State whether the function $f(x) = x^3 - 3x + \sin x + x \cos x$, is odd or even.
 - c) If $y = \sin x \cdot \cos 2x$, find $\frac{dy}{dx}$.
 - d) Evaluate : $\int \cos^2 x \, dx$.
 - e) Evaluate : $\int \frac{1}{3x+5} \, dx$.
 - f) Find the area between the line $y = 2x$, X-axis and the ordinates $x = 1$ and $x = 3$.
 - g) Find approximate root of the equation $x^2 + x - 3 = 0$ in (1, 2) by using Bisection method. (Use two iterations)

P.T.O.

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

- a) Find $\frac{dy}{dx}$ if $x^3 + xy^2 = y^3 + yx^2$
- b) Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ if $x = a \cos^3 \theta$, $y = b \sin^3 \theta$
- c) A manufacture can sell x items per week at a price $(23 - 0.001x)$ rupees each. It cost $(5x + 2000)$ rupees to produce x items. Find the number of items to be produced per week for maximum profit.
- d) Find the radius of curvature of the curve $y = e^x$ at the point where it crosses the Y-axis.

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

- a) Find the equation of tangent and normal to the curve $2x^2 - xy + 3y^2 = 18$ at $(3, 1)$.
- b) Differentiate with respect to x : $x^x + 5^x + x^5 + 5^5$
- c) If $x^3 \cdot y^2 = (x + y)^5$, show that $\frac{dy}{dx} = \frac{y}{x}$
- d) Evaluate : $\int \frac{e^x(x + 1)}{\sin^2(xe^x)} dx$.

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

- a) Evaluate: $\int \frac{x - 3}{x^3 - 3x^2 - 16x + 48} dx$
- b) Evaluate: $\int \frac{1}{2 + 3 \cos x} dx$
- c) Evaluate: $\int e^x \cdot \sin 4x dx$
- d) Evaluate: $\int \frac{e^x}{(e^x - 1)(e^x + 1)} dx$
- 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 two parabolas $y^2 = 2x$ and $x^2 = 2y$.
- b) Solve the following:
- (i) Form the differential equation from the relation

$$y = A \cdot e^x + B \cdot e^{-x}$$
- (ii) Solve $\frac{dy}{dx} + y \cdot \cot x = \operatorname{cosec} x$
- c) The velocity of a particle is given by $\frac{dx}{dt} = 3t^2 - 6t + 8$.
 Find the distance covered in 2 seconds given that $x = 0$ at $t = 0$.

6. Solve any TWO of the following:

12

- a) Solve the following:
- (i) Solve the following system of equations by Jacobi-Iteration method. (Two iterations)
- $$15x + 2y + z = 18,$$
- $$2x + 20y - 3z = 19,$$
- $$3x - 6y + 25z = 22.$$
- (ii) Solve the following system of equations by using Gauss - Seidal method. (Two iterations)
- $$5x - 2y + 3z = 18;$$
- $$x + 7y - 3z = 22;$$
- $$2x - y + 6z = 22.$$
- b) Solve the following system of equations by Gauss Elimination Method.
- $$6x - y - z = 19,$$
- $$3x + 4y + z = 26,$$
- $$x + 2y + 6z = 22$$
- c) Using Newton - Raphson method find the approximate value of $\sqrt[3]{100}$ (Perform 4 iterations)
-