

22224

22223

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) 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 $f(x) = px^2 + 11$, and $f(-1) = 15$. Find value of p .
 - b) If $f(x) = (16)^x - \log_2 x$, find $f\left(\frac{1}{2}\right)$
 - c) If $y = \log [\sec x + \tan x]$ find $\frac{dy}{dx}$
 - d) Evaluate : $\int \log x \, dx$
 - e) Evaluate : $\int \frac{dx}{2x+11}$
 - f) Find the area enclosed by the curve $y = x^3$ and ordinate $x = 1$, $x = 3$ and x – axis.
 - g) Find the approximate roots of the equation $x^3 - x - 4 = 0$ by Bisection Method (Two iteration)

P.T.O.

2. Solve any THREE of the following:

12

- a) If $f(x) = \frac{2x+5}{3x-4}$ and $t = \frac{5+4x}{3x-2}$ Find $f(t)$.
- b) If $x^2 + y^2 = 4xy$. Find $\frac{dy}{dx}$ at $(2, -1)$
- c) A metal wire 36 cm long is bent to form a rectangle.
Find its dimension when its area is maximum.
- d) A beam is bent in the form of curve $y = 2\sin x - \sin 2x$.
Find radius of curvature of the beam at the point $x = \frac{\pi}{2}$

3. Solve any THREE of the following:

12

- a) Find equation of tangent and normal to the curve $y = 4xe^x$ at the origin.
- b) If $y = \sin^{-1} \left(\frac{\cos x + \sin x}{\sqrt{2}} \right)$. Find $\frac{dy}{dx}$.
- c) If $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$.
Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{2}$
- d) Evaluate $\int \sin 3x \cdot \cos 7x \, dx$.

4. Solve any THREE of the following:

12

- a) Evaluate : $\int \frac{e^x(x+1)}{\cos^2(x \cdot e^x)} \, dx$.
- b) Evaluate : $\int \frac{dx}{5+4\cos x}$.
- c) Evaluate : $\int x^{2018} \cdot \log x \, dx$.
- d) Evaluate : $\int \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} \, dx$.
- e) Evaluate : $\int_1^5 \frac{\sqrt[3]{9-x}}{\sqrt[3]{9-x} + \sqrt[3]{x+3}} \, dx$

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

- a) Find the area bounded by the two parabolas $y^2 = 4x$ and $x^2 = 4y$ using itegration.
- b) Solve the following:
- Solve : $\frac{dy}{dx} = e^{3x-2y} + x^2 \cdot e^{-2y}$
 - Form the differential equation by eliminating arbitrary constant $y = A\cos 3x + B\sin 3x$
- c) A circuit consists of a resistance 'R' and condenser of capacity 'C' Farads connected to a constant E.M.F.'E'. If the differential equation of the circuit is given by
- $$\frac{q}{c} = E - R \frac{dq}{dt}, \text{ find } q, \text{ given that } q = 0 \text{ when } t = 0$$

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

- a) Attempt the following :
- Solve the following system of equation by Jacobi-iteration (Two iteration).

$$10x + y + 2z = 13, \quad 3x + 10y + z = 14$$

$$2x + 3y + 10z = 15$$
 - Solve the following system of equation by Gauss-Seidal Method (Two iteration).

$$10x + y + z = 12, \quad 2x + 10y + z = 13$$

$$2x + 2y + 10z = 14$$
- b) Solve the following system of equation using Gauss elimination method.

$$2x + y + z = 10, \quad 3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$
- c) Using Newton Raphson Method
 Evaluate $\sqrt[3]{100}$ (Carry out four iteration).
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