

22224

12223

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. Attempt any FIVE of the following: 10

- a) If $f(x) = x^4 - 2x + 7$ then find $f(0) + f(2)$.
- b) If $f(x) = \tan x$, then show that $f(2x) = \frac{2 \cdot f(x)}{1 - [f(x)]^2}$
- c) If $y = 2^x + \cos(3x)$. Find $\frac{dy}{dx}$.
- d) Evaluate : $\int \frac{\sin x}{\cos^2 x} dx$
- e) Evaluate : $\int \frac{1}{x(x-1)} dx$
- f) Show that the root of the equation $x^3 - x - 4 = 0$ lies between '0' and '2'.
- g) Find the area under the curve $y = e^x$ from the ordinate $x = 0$ to $x = 1$ and x -axis.

P.T.O.

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

- a) If $x \sin y + y \sin x = 0$ find $\frac{dy}{dx}$.
- b) If $x = a \cos \theta$, $y = a \sin \theta$. Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.
- c) Find the maximum and minimum values of $2x^3 - 3x^2 - 36x + 10$.
- d) A metal wire 100 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

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

- a) Find radius of curvature of the curve $\sqrt{x} + \sqrt{y} = 1$ at $(\frac{1}{4}, \frac{1}{4})$.
- b) Find the equation of tangent to the curve $y = x^2 - x - 6$ where it cuts the X-axis.
- c) If $y = \log[\log(\log x)]$. Find $\frac{dy}{dx}$.
- d) Evaluate : $\int \frac{dx}{x[9 + (\log x)^2]}$

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

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

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

- a) Find the area bounded by the curve $y = x^2$ and the line $y = x$.
- b) i) Solve : $x(1 + y^2)dx + y(1 + x^2)dy = 0$.
- ii) Show that $y = A \sin mx + B \cos mx$ is solution of differential equation $\frac{d^2y}{dx^2} + m^2y = 0$.
- c) The current in a circuit is given by $i = \frac{dq}{dt} = 20e^{-5t}$, find amount of charge q transferred between $t = 0$ to 0.1 sec.

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

- a) Solve the following by using Jacob's method upto four iterations
 $20x + y - 2z = 17$, $3x + 20y - z = -18$,
 $2x - 3y + 20z = 25$.
- b) i) Using Bisection method find approximate roots of the equation $x^3 - x - 4 = 0$ upto three iterations.
- ii) Find approximate value of $\sqrt[3]{7}$ by using Newton Raphson method. (three iterations only)
- c) Solve the equation by using Gauss Elimination method.
 $2x + 2y + 3z = 4$,
 $4x - 2y + z = 9$,
 $x + 5y + 4z = 3$.
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