22224

24225

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 $f(x) = x^4 - 2x + 7$ then find $f(0) + f(2)$.

b) If $f(x) = \dfrac{e^x + e^{-x}}{2}$ state whether function $f(x)$ is even or odd.

c) Find $\dfrac{dy}{dx}$ if $y = x \cdot \sin x$

d) Evaluate $\displaystyle\int \sqrt{\dfrac{1 - \cos 2x}{1 + \cos 2x}} \ dx$

e) Evaluate $\displaystyle\int \dfrac{dx}{3x + 4}$

f) Find the area bounded by the curve $y = 3x^2$ and the ordinates $x = 1$ and $x = 3$.

g) Find the real root of the equation $x^3 - x - 1 = 0$ by using Bisection method in one iterations only.

Marks

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

a) Find $\dfrac{dy}{dx}$ if $x^2 + y^2 + xy - y = 0$ at $(1, 2)$

b) If $x = a(1 - \sin\theta)$, $y = a(1 - \cos\theta)$ find $\dfrac{dy}{dx}$ at $\theta = \dfrac{\pi}{4}$

c) Find maximum and minimum values of $x^3 - 18x^2 + 96x = 0$.

d) Find radius of curvature of curve $\sqrt{x} + \sqrt{y} = 1$ at $\left(\dfrac{1}{4}, \dfrac{1}{4}\right)$.

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

a) Find the equation of tangent and normal to the curve
$y = x(2 - x)$ at $(2, 0)$

b) Find $\dfrac{dy}{dx}$ if $y = (\sin x)^x + (x)^{\sin x}$

c) If $x^y = e^{(x-y)}$ then show that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$.

d) Evaluate $\displaystyle\int 3x \cdot \sqrt{x^2 + 4}\ dx$.

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

a) Evaluate $\displaystyle\int \dfrac{dx}{\sqrt{x^2 - 6x + 13}}$

b) Evaluate $\displaystyle\int \dfrac{dx}{4 - 5\cos x}$

c) Evaluate $\displaystyle\int \dfrac{dx}{x(2 + \log x)(3 + \log x)}$

d) Evaluate $\displaystyle\int x \cdot \tan^{-1}x\ dx$

e) Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{dx}{1 + \sqrt{\tan x}}$

Marks

5. Solve any TWO of the following: 12

a) Find the area of region included between the parabola $y = x^2 + 1$ and line $y = 2x + 1$.

b) **Solve the following**

i) Solve $\dfrac{dy}{dx} + y\tan x = \cos^2 x$

ii) Form the differential equation by eliminating arbitrary constants if $y = A e^{3x} + B e^{-3x}$

c) If $L\dfrac{di}{dt} = 30\sin(10\pi t)$ find 'i' in terms of t, given that $L = 2$, $i = 0,\ t = 0$.

6. Solve any TWO of the following: 12

a) **Solve the following**

i) Solve the following system of equations by using Gauss-Seidal method upto two iterations
$20x + y - 2z = 17,\ 3x + 20y - z = -18,\ 2x - 3y + 20z = 25.$

ii) Solve the following system of equations by Jacobi's method upto two iterations
$5x + 2y + z = 12,\ x + 4y + 2z = 15,\ x + 2y + 5z = 20.$

b) Solve the following system of equations by Gauss Elimination method
$x + 2y + 3z = 14,\ 3x + y + 2z = 11,\ 2x + 3y + z = 11$

c) Using Newton's Raphsons method find the approximate root of the equation $x^3 - 4x + 1 = 0$ up to four iteration.

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