

24209

23124

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) 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.
 - (8) Programmable pocket calculator is not allowed.

Marks

1. Solve any FIVE of the following: **10**
- a) Define even and odd function.
 - b) If $f(x) = x^3 - 3x^2 + 5$, Find $f(0) + f(3)$
 - c) Find $\frac{dy}{dx}$ if; $y = \frac{\log x}{x}$
 - d) Evaluate : $\int (\log_a a + e^{2\log x} + e^{x\log a}) dx$
 - e) Evaluate : $\int x \cdot \cos x dx$
 - f) Find area bounded by the curve $y = x^3$, X-axis and co-ordinates $x = 1, x = 3$
 - g) Find the root of equation $x^3 - 9x + 1 = 0$ which lies between 2 and 3 using Regula Falsi method. (Use two iterations)

P.T.O.

2. Solve any THREE of the following:

12

- a) Find $\frac{dy}{dx}$ if $y = \log(x.e^x)$
- b) If $x^2 + y^2 + xy - y = 0$, find $\frac{dy}{dx}$ at (1, 2)
- c) Find $\frac{dy}{dx}$ if $x = a\cos^3t$, $y = a\sin^3t$.
- d) A 36cm long metal wire is bent to form a rectangle. Find its dimensions when its area is maximum.

3. Solve any THREE of the following:

12

- a) A manufacture can sell 'x' items at price of ₹ (330 - x) each. The cost of producing x-items is ₹ $x^2 + 10x + 12$. How many items must be sold so that his profit is maximum.
- b) Find $\frac{dy}{dx}$ if $y = \sin^{-1}\left(\frac{\cos x + \sin x}{\sqrt{2}}\right)$
- c) If $e^y = y^x$ prove that $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$
- d) Solve : $\int \cos^3 x \cdot \sin^2 x \cdot dx$

4. Solve any THREE of the following:

12

- a) Solve : $\int \frac{2 \tan x}{\cos^2 x} \cdot dx$
- b) Evaluate : $\int \frac{dx}{x^2 + 4x + 25}$
- c) Evaluate : $\int x^2 \cdot e^x \cdot dx$
- d) Evaluate : $\int \frac{\sec^2 x}{(2 + \tan x)(3 + \tan x)} dx$
- e) Evaluate : $\int_0^{\pi/2} \frac{1}{1 + \cot x} dx$

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

- a) Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ about x - axis.
- b) i) If 20% of the bolts produced by machine are defective. Find the probability that out of four bolts drawn,
(1) One is defective
(2) At the most two are defective
- ii) The probability that a bomb dropped from a plane will strike the target is $\frac{1}{5}$. If six bombs are dropped, find the probability that exactly two will strike the target.
- c) In a test on 2000 electric bulbs, it was found that the life of particular make was normally distributed with average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for:
i) Between 1920 hours and 2160 hours.
ii) More than 2150 hours.

Given that : $A(2) = 0.4772$, $A(1.83) = 0.4664$

6. Solve any TWO of the following:

12

a) Attempt the following.

i) Using Regula Falsi method, find the root of $x^3 - x - 4 = 0$
(Two iterations)

ii) Solve the following system of equations by using
(Gauss-Seidal method. (Two iterations)

$$15x + 2y + z = 18, 2x + 10y - 3z = 19, 3x - 6y + 25z = 22$$

b) Using Newton-Raphson method, find the approximate value
of $\sqrt[3]{100}$ (perform four iterations)

c) Solve the equation using Jacobi's method (upto three iterations)

$$10x - 2y - 2z = 6$$

$$-x - y + 10z = 8$$

$$-x + 10y - 2z = 7$$
