

22206

12425

03 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) Figures to the right indicate full marks.
(4) Use of Non-programmable Electronic Pocket Calculator is permissible.
(5) 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) Whether the function $f(x) = 4x^3 - 3x + x\cos x + 2\sin x$ is even or odd?
- b) If $f(x) = \log x$. Show that $f(mn) = f(m) + f(n)$
- c) Find $\frac{dy}{dx}$, if $y = \frac{4+x^2}{\cot 3x}$
- d) Evaluate : $\int (3x-5)^8 \cdot dx$
- e) Evaluate : $\int \sqrt{1-\cos 2x} \cdot dx$
- f) Find the area bounded by the curve $y = 2x$, x -axis and $x = 1$, $x = 3$.
- g) An unbiased coin is tossed 5 times. What is the probability of getting exactly 3 heads.

P.T.O.

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

- a) Find $\frac{dy}{dx}$, if $2x^3 + 4y^3 = 3xy$
- b) Find $\frac{dy}{dx}$, if $y = \sin^{-1} (2x\sqrt{1-x^2})$
- c) The perimeter of rectangle is 100 cm. Find the dimensions of its sides when area of rectangle is maximum.
- d) Find the radius of curvature for $y^2 = 4x$ at $(2, 2\sqrt{2})$

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

- a) Find the equation of the tangent and normal to the ellipse $4x^2 + 9y^2 = 40$ at the point (1, 2)
- b) Find $\frac{dy}{dx}$, if $y = (\tan x)^{\sin x}$.
- c) Find $\frac{dy}{dx}$, at $\theta = \frac{\pi}{4}$
If $x = a(2\theta - \sin 2\theta)$
 $y = a(1 - \cos 2\theta)$
- d) Evaluate : $\int \frac{2x \cdot \sin^{-1}(x^2)}{\sqrt{1-x^4}} dx$

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

- a) Evaluate : $\int \frac{dx}{2x^2 - 4x + 5}$
- b) Evaluate : $\int \frac{\sec^2 x}{(1 - \tan x)(2 + \tan x)} dx$
- c) Evaluate : $\int x \cdot \tan^{-1} x \cdot dx$
- d) Evaluate : $\int \frac{1}{5 + 4\cos x} \cdot dx$
- e) Evaluate : $\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x} + \sqrt{x+4}} dx$

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

- a) Find the area bounded by the parabola $y^2 = 4x$ and the line $y = x$.
- b) Solve the following:
- Find the order and degree of the differential equation:

$$\frac{d^2y}{dx^2} = \sqrt{y + \left(\frac{dy}{dx}\right)^2}$$
 - Solve the differential equation $\frac{dy}{dx} + y \cdot \tan x = \cos^2 x$.
- c) The particle start from rest. It's acceleration at any time t is $(t + 3) \text{ m/s}^2$. Find the distance travelled in 5 seconds.

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

- a) Attempt the following:
- If 2% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs, 3 bulbs will be defective.
 - If 40% of the bolts produced by a mechanic are defective, determine the probability that out of 5 bolts drawn one is defective.
- b) An automatic machine make paper clips from coil of wire. On the average, 1 in 400 paper clips is defective. If the paper clips are packed in boxes of 100, what is the probability that any given box of clips will contain atleast one defective clip?
- c) A sample of 100 dry battery cells tested to find the length of life produced the following results, mean $(\bar{x}) = 12$ hours, S.D. $(\bar{\sigma}) = 3$ hours.

Assuming the data to be normally distributed what percentage of battery cells are expected to have life.

- More than 15 hours
- Less than 6 hours
- Between 10 and 14 hours

Given : $A(1) = 0.3413$

$A(2) = 0.4772$

$A(0.67) = 0.2487$
