

22206

21819

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. Attempt any FIVE of the following:

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- a) State whether the function is even or odd,
If $f(x) = 3x^4 - 2x^2 + \cos x$.
- b) If $f(x) = x^2 + 6x + 10$ find $f(2) + f(-2)$
- c) Find $\frac{dy}{dx}$ if $y = \log x + \log_5 x + \log_5 5$
- d) Evaluate $\int \sin^2 x \, dx$
- e) Evaluate $\int (x^a + a^x + a^a) \, dx$
- f) Find the area under the curve $y = e^x$ between the ordinates $x = 0$ and $x = 1$.
- g) An unbiased coin is tossed 5 times. Find the probability of getting three heads.

P.T.O.

2. **Attempt any THREE of the following:** 12
- If $x^2 + y^2 = 4xy$ find $\frac{dy}{dx}$ at $(2, -1)$
 - If $x = a(1 + \cos \theta)$ and $y = a(1 - \cos \theta)$ find $\frac{dy}{dx}$
 - A metal wire of 40 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.
 - A telegraph wire hangs in the form of a curve $y = a \cdot \log \sec\left(\frac{x}{a}\right)$ where 'a' is constant. Show that the curvature at any point is $\frac{1}{a} \cdot \cos\left(\frac{x}{a}\right)$.
3. **Attempt any THREE of the following:** 12
- Find the equation of tangent and normal to the curve $y = x(2 - x)$ at point $(2, 0)$
 - Find $\frac{dy}{dx}$ if $y = a^x + x^a + a^a + x^x$
 - If $y = \tan^{-1}\left(\frac{5x}{1 - 6x^2}\right)$ find $\frac{dy}{dx}$
 - Evaluate $\int \frac{(x-1)e^x}{x^2 \cdot \sin^2\left(\frac{e^x}{x}\right)} dx$
4. **Attempt any THREE of the following:** 12
- Evaluate $\int \frac{1}{x + \sqrt{x}} dx$
 - Evaluate $\int \frac{dx}{5 + 4 \cos x}$
 - Evaluate $\int x \cdot \tan^{-1} x dx$
 - Evaluate $\int \frac{\sec^2 x}{(1 + \tan x)(2 - \tan x)} dx$
 - Evaluate $\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x} + \sqrt{x+4}} dx$

5. Attempt any TWO of the following:**12**a) Find the area bounded by curves $y^2 = x$ and $x^2 = y$.

b) Attempt the following

i) Solve the differential equation

$$\frac{dy}{dx} + y \tan x = \cos^2 x$$

ii) Find order and degree of the differential equation.

$$\frac{d^2 y}{dx^2} = \sqrt[4]{y + \left(\frac{dy}{dx}\right)^2}$$

c) Acceleration of a moving particle at the end of 't' seconds from the start of its motion is $(5 - 2t)$ m/s². Find its velocity at the end of 3 seconds and distance travelled by it during that period, if its initial velocity is 4 m/s.**6. Attempt any TWO of the following:****12**

a) Attempt the following

i) The probability that a man aged 65 will live to 75 is 0.65. What is the probability that out of 10 men which are now 65, 7 will live to 75.

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.

b) If 2% of the electric bulbs manufactured by company are defective, find the probability that in a sample of 100 bulbs.

(i) 3 bulbs are defective,

(ii) At the most two bulbs will be defective. ($e^{-2} = 0.1353$)

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: $A(2) = 0.4772$ $A(1.83) = 0.4664$
