

22206

22223

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) 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) If $f(x) = x^2 - 2x + 5$, find $f(1) + f(2)$
- b) State whether the function $f(x) = \frac{e^x + e^{-x}}{2}$ is even or odd, give reason.
- c) Find $\frac{dy}{dx}$ if $y = x^2 \cdot e^x$
- d) Evaluate $\int \frac{1}{1 + \cos 2x} dx$.
- e) Evaluate $\int \frac{1}{3x+5} dx$.
- f) Find the area bounded by the curve $y = \sin x$, x - axis and the ordinates $x = 0$, $x = \frac{\pi}{2}$.
- g) An unbiased coin is tossed 6 times, find the probability of getting exactly 4 heads.

P.T.O.

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

- a) Find $\frac{dy}{dx}$ if $x^2 + y^2 + xy - y = 0$ at $(1, 2)$
- b) If $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$
- c) A metal wire 36 cm long is bent to form a rectangle, find its dimensions when its area is maximum.
- d) A beam is bent in the form of the curve $y = 2\sin x - \sin 2x$. Find the radius of curvature of the beam at point $x = \frac{\pi}{2}$.

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

- a) Find the equation of tangent and normal to the curve $y = 4xe^x$ at origin.
- b) Find $\frac{dy}{dx}$ if $y = x^x + (\sin x)^x$.
- c) Find $\frac{dy}{dx}$ if $y = \tan^{-1} \left(\frac{a+x}{1-ax} \right)$.
- d) Evaluate $\int \frac{e^x(1+x)}{\sin^2(xe^x)} dx$.

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

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

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

- a) Find the area bounded by the parabolas $y^2 = 9x$ and $x^2 = 9y$.
- b) Solve the following:
- i) Find the order and degree of the differential equation.

$$\frac{d^2y}{dx^2} = \sqrt{y - \frac{dy}{dx}}$$

- ii) Solve the differential equation.

$$\frac{dy}{dx} = e^x e^{-y} + x e^{-y}$$

- c) The velocity of a particle is given by $\frac{dx}{dt} = 3t^2 - 6t + 8$.
Find the distance covered in 2 seconds given that
 $x = 0$ at $t = 0$.

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

- a) Attempt the following:
- i) The probability that a person is a swimmer is $2/5$.
What is the probability that out of 4 persons contacted
at random, exactly 1 is a swimmer.
- ii) If in Poisson's distribution $P(2) = P(3)$, find $P(4)$
- b) In a certain factory producing cycle tyres, there is a small change
of 1 in 500 tyres to be defective. The tyres are supplied in lots
of 10. Using Poisson's distribution find the approximate number
of lots containing.
- i) no defective.
- ii) two defective tyres respectively in a consignment of
10,000 lots.
- c) A factory manufactured 2000 electric bulbs with average life
2040 hours and S.D. of 60 hours. Assuming normal distribution,
find number of bulbs having life.
- i) more than 2150 hours.
- ii) less than 1960 hours.

$$\text{Given } A(1.83) = 0.4667$$

$$A(1.33) = 0.4082$$
