



17349

15162

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All questions are **compulsory**.
 - (2) Illustrate your answers with **neat sketches wherever necessary**.
 - (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. Attempt **any ten** of the following :

(10×2=20)

- a) Find the point on the curve $y = 3x - x^2$ if the slope is -5 .
- b) Find the radius of curvature of the curve $y = x^3$ at $(2, 8)$.
- c) Evaluate $\int x(x-1)^2 dx$.
- d) Evaluate $\int e^{\sin x} \cdot \cos x dx$.
- e) Evaluate $\int x \sin x dx$.
- f) Evaluate $\int \frac{1}{(x+1)(x+2)} dx$.
- g) Evaluate $\int_2^3 \frac{dx}{x+1}$.
- h) Find the area under the curve $y = x^2$ from $x = 0$ to $x = 3$ with x-axis.
- i) Find order and degree of $\frac{d^2y}{dx^2} = \left[1 + \left(\frac{dy}{dx} \right)^2 \right]^3$.
- j) Form the differential equation of $y = ax^2$.
- k) An unbiased coin is tossed 6 times. Find the probability of getting 2 heads.
- l) An urn contain 8 blue, 7 green and 5 red balls. A ball is taken at random from an urn. What is the probability that the ball is (i) red (ii) blue.

P.T.O.



2. Attempt **any four** of the following :

(4×4=16)

- a) Find the equation of the tangent and normal to the curve $y = x^2$ at $(-1, 1)$.
- b) 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 $x = \frac{\pi}{2}$.
- c) Find maximum and minimum values of $x^3 - 12x - 5$.
- d) Evaluate $\int \frac{1}{1 + \cos 2x} dx$.
- e) Evaluate $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$.
- f) Evaluate $\int \frac{dx}{x^2 + 4x + 5}$.

3. Attempt **any four** of the following :

(4×4=16)

- a) Evaluate $\int_0^1 x e^x dx$.
- b) Evaluate $\int_0^{\frac{\pi}{2}} \frac{1}{1 + \tan x} dx$.
- c) Find area bounded by two curves $y = x$ and $y = x^2$.
- d) Solve $\frac{dy}{dx} = (4x + y + 1)^2$.
- e) Solve $\frac{dy}{dx} = \frac{x^2 + y^2}{xy}$.
- f) Solve $x \frac{dy}{dx} + y = x^3$.



[3]

17349

Marks

4. Attempt any four of the following :

(4×4=16)

a) Evaluate $\int_1^4 \frac{\sqrt{5-x}}{\sqrt{x} + \sqrt{5-x}} dx$.

b) Evaluate $\int_0^{\pi/4} \log(1 + \tan x) dx$.

c) Find the area of the circle $x^2 + y^2 = 36$ by integration.

d) Solve $\frac{dy}{dx} = e^x \cdot e^{-y} + x e^{-y}$.

e) Solve $(x^2 + 6xy - y^2) dx + (3x^2 - 2xy + y^2) dy = 0$.

f) Verify that $y = \sin(\log x)$ is a solution of differential equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$.

5. Attempt any four of the following :

(4×4=16)

a) If two dice are rolled. Find the probability that the sum is equal to 9.

b) An unbiased coin is tossed 5 times. Find the probability of getting :

i) three heads

ii) atleast 4 heads

c) Fit a Poisson distribution.

x	0	1	2	3	4
f	122	60	15	2	1

d) Evaluate $\int \frac{dx}{5 + 4 \cos x}$.

e) Evaluate $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \tan x}$.

f) Solve $\frac{dy}{dx} = \cos(x + y)$.



6. Attempt **any four** of the following :

a) If $P(A) = \frac{2}{3}$, $P(B') = \frac{3}{4}$ and $P\left(\frac{A}{B}\right) = \frac{4}{5}$.

Find: i) $P(A \cap B)$

ii) $P\left(\frac{B}{A}\right)$.

b) The probability of getting an item defective is 0.005. What is the probability that exactly 3 items in a sample of 200 are defective ?

(Given : $e^{-1} = 0.3679$)

c) I.Q.s are normally distributed with mean 100 and S.D. 15.

Find the probability that a randomly selected person has (i) I.Q. more than 130 (ii) I.Q. between 85 and 115.

d) Divide 80 into two parts such that their product is maximum.

e) Find the equations of tangents to the curve $y = x^2 - 2x - 3$ where it meets the x-axis.

f) Find the area enclosed by the parabolas $y^2 = x$ and $x^2 = y$.
