

17301

11718

3 Hours / 100 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Figures to the right indicate full marks.
 - (3) Assume suitable data, if necessary.
 - (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.
 - (6) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. Attempt any TEN of the following: 20

- a) Find radius of curvature of the curve $y = x^3$ at (2, 8)
- b) Find the point on the curve $y = 7x - 3x^2$ where the inclination of the tangent is 45° .
- c) Evaluate: $\int x \cdot \sin x \, dx$
- d) Evaluate: $\int e^{2 \cdot \log x} \, dx$
- e) Evaluate: $\int \sin^2 x \, dx$
- f) Evaluate: $\int \frac{dx}{\sqrt{4 - 9x^2}}$
- g) Evaluate: $\int_0^{\pi/2} \sin x \cdot \cos x \, dx$

P.T.O.

- h) Find the area under the curve $y = x^2$ from $x = 0$ to $x = 3$ with x axis.
- i) Find the order and degree of the equation

$$\left[1 + \left(\frac{dy}{dx} \right)^3 \right]^{5/3} = 2 \frac{d^2y}{dx^2}$$
- j) Verify that $y = \log x$ is a solution of $x \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$
- k) Find the probability of getting sum of numbers is 9 with two dice.
- l) Three fair coins are tossed. Find the probability that atleast two heads appear.

2. Attempt any FOUR of the following:

16

- a) Evaluate: $\int \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx$
- b) Evaluate: $\int \cos(\log x) dx$
- c) Evaluate: $\int x \cdot \tan^{-1} x dx$
- d) Find maximum and minimum value of $y = 2x^3 - 3x^2 - 36x + 10$
- e) Find the radius of curvature of the curve $\sqrt{x} + \sqrt{y} = 1$ at $\left(\frac{1}{4}, \frac{1}{4} \right)$
- f) Find the equation of the tangent and normal to the curve $x^2 + 3xy + y^2 = 5$ at $(1, 1)$

3. Attempt any FOUR of the following:

16

- a) Solve: $\frac{dy}{dx} = (4x + y + 1)^2$
- b) Solve: $(x^2 + y^2) dx - 2xy dy = 0$
- c) Solve D.E. $(2xy + y^2) dx + (x^2 + 2xy + \sin y) dy = 0$
- d) Find the area of the circle $x^2 + y^2 = 16$ using integration.

e) Evaluate: $\int_0^{\pi/2} \frac{dx}{5 + 4 \cos x}$

f) Evaluate: $\int_0^{\pi/2} \frac{1}{1 + \sqrt{\tan x}} dx$

4. Attempt any FOUR of the following:

16

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

b) Evaluate: $\int \frac{x}{(x^2 - 1)(x^2 + 2)} dx$

c) Find area enclosed between the parabolas $y^2 = 4x$ and $x^2 = 4y$.

d) Verify that $y^2 = ax^2$ is a solution of $x\left(\frac{dy}{dx}\right)^2 - 2y\frac{dy}{dx} + ax = 0$

e) Solve $x \log x \frac{dy}{dx} + y = 2 \log x$

f) Solve $\left[4 - \frac{y^2}{x^2}\right] dx + \frac{2y}{x} dy = 0$

5. Attempt any FOUR of the following:

16

a) Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first card is a king and the second is a queen, if the first card is

(i) replaced

(ii) not replaced

b) If 5% of the electric bulbs manufacturing by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs.

(i) None is defective

(ii) Five bulbs are defective ($e^{-5} = 0.007$)

c) In a certain examination 500 students appeared. Mean score is 68 with S.D. 8. Find the number of students scoring

- (i) Less than 50
(ii) More than 60

(Given that area between $z = 0$ to $z = 2.25$ is 0.4878 and area between $z = 0$ to $z = 1$ is 0.3413)

d) Evaluate: $\int e^x \sin 3x \, dx$

e) Evaluate: $\int_0^{\pi/2} \sin 3x \cdot \cos 3x \, dx$

f) Solve the DE $\frac{dy}{dx} = e^{3x-2y} + x^2 e^{-2y}$

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

16

a) Find the equation of tangent and normal to the curve $y = t - \frac{1}{t}$ and $x = \frac{1}{t}$ when $t = 2$.

b) A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

c) Two six faced unbiased dice are thrown. Find the probability that the sum of the numbers shown is 7 or product is 12.

d) If A and B are two events such that $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{7}{12}$ find $P(A' \cap B')$.

e) In 200 sets of tosses of 5 fair coins, in how many ways you can expect.

- (i) at least two heads
(ii) at the most two heads

f) A problem is given to the three students Ram, Shyam and Amit, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. If they attempt to solve a problem independently, Find the probability that the problem is solved by atleast one of them.