17349

3 Hours / 100 Marks   Seat No.

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. **Solve any <u>TEN</u> of the following:**   **20**

a) Find the point on the curve $y = 7x - 3x^2$. Where the inclination of the tangent is 45°.

b) Find radius of curvatures of the curve $y = x^3$ at (2,8)

c) Evaluate $\int (1-x)^{10} \, dx$

d) Evaluate $\int x \cdot e^x \, dx$

e) Evaluate $\int \dfrac{x}{x^2 - 1} \, dx$

f) Evaluate $\int e^{e^x} \cdot e^x \, dx$

g) Evaluate $\int_{1}^{2} \dfrac{1}{3x - 2} \, dx$

h) Find area bounded by curve $y = x^2$ from $x = 0$ to $x = 2$ and x axis.

i) Find order and degree of differential equation.

$$\frac{d^2 y}{dx^2} = \left[y + \frac{dy}{dx} \right]^{3/2}$$

j) From a differential equation if $y = Ae^x + Be^{-x}$.

k) Three unbiased coins are tossed, what is the probability of getting at least one head.

l) If $P(A) = \frac{1}{2}$, $P(B') = \frac{2}{3}$ and $P(A \cup B) = \frac{2}{3}$ find $P(A' \cup B')$

2. **Solve any <u>FOUR</u> of the following:**   **16**

a) Find equation of tangent to the curve $y = 4x\, e^x$ at the origin.

b) Find maximum and minimum values of $x^3 - 9x^2 + 24x$.

c) Find radius of curvature of curve $x^2 + y^2 = 25$ at point $(3, -4)$.

d) Evaluate $\int \cos 8x \cdot \cos 2x \, dx$

e) Evaluate $\int \frac{e^x (x+1)}{\cos^2 (x \cdot e^x)} \, dx$

f) Evaluate $\int \frac{x+1}{x(x^2 - 4)} dx$

3. **Solve any <u>FOUR</u> of the following:**   **16**

a) Evaluate $\int\limits_{0}^{\pi/2} \frac{1}{1 + \sqrt{\cot x}} \, dx$

b) Evaluate $\int \tan^{-1} x \, dx$

c) Find area bounded between the line $y = x$ and parabola $y = x^2$.

d) Verify that $y = \log x$ is a solution of the differential equation

$$x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$$

e) Solve $\sec^2 x \cdot \tan dx + \sec^2 y \cdot \tan x \, dy = 0$.

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

4. **Solve any FOUR of the following:** 16

a) Evaluate $\int x^{2017} \cdot \log x \; dx$

b) Evaluate $\int\limits_{0}^{\pi/4} \log[1 + \tan x] \; dx$

c) Evaluate $\int\limits_{1}^{5} \dfrac{\sqrt[3]{9-x}}{\sqrt[3]{9-x} + \sqrt[3]{x+3}} \; dx$

d) Solve $\sqrt{1-x^2} \; dy + \sqrt{1-y^2} \; dx = 0$

e) Solve $(3x^2 - y) \, dx - x dy = 0$

f) Solve $\dfrac{dy}{dx} + (\tan x) \cdot y = \cos^2 x$

5. **Solve any FOUR of the following:** 16

a) A problem of mathematics is given to three students A,B,C whose chances of solving it are $\frac{1}{3}, \frac{3}{4}$, and $\frac{1}{4}$ resp. What is the probability that :

(i)   The problem will be solved,

(ii)   The problem will be solved by each of them?

b) If two dice are rolled simultaneously then find the probability that total is 6 or 10.

c) Evaluate $\int \dfrac{1}{5 + 4\cos x} \; dx$

d) Evaluate $\int\limits_{0}^{\pi} \dfrac{x \cdot \sin x}{1 + \cos^2 x} \; dx$

e) Find area of circle $x^2 + y^2 = 4$.

f) Fit a poisson distribution for the following observations.

x_i	20	30	40	50	60	70
f_i	8	12	30	10	6	4

Marks

6. **Solve any FOUR of the following:** **16**

a) A bullet is fired into a mud bank and penetrates $(120t - 3600\,t^2)$ meters in t sec after impact. Calculate maximum depth of penetration.

b) The slope of the curve $2y^3 = ax^2 + b$ at $(1, -1)$ is same as the slope of line $x + y = 0$, find a and b.

c) Find area bounded by parabola $y = 16 - x^2$ and x axis.

d) The number of road accidents met with by taxi drivers. Follow Poisson distribution with mean 2 out of 5000 taxis in the city, find the number of drivers:

   (i) Who does not meet with an accident.

   (ii) Who met with an accident more than 3 times?

e) A multiple choice test contains 20 questions. Each question have five choices for the correct answer. What is the probability of making 80% with random guessing?

f) GRE exam scores are normally distributed with mean 500 and S.D 100. Find the probability that a randomly selected GRE exam score is greater than 620. (Given Area at 1.2 is 0.3849).

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