16117
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. Attempt any TEN of the following : **20**

(a) Find the point on the curve $y = x^2 - 4x + 2$ where the slope of tangent is 10.

(b) Find the radius of curvature of $y^2 = 4x$ at point (1, 2).

(c) Evaluate $\int \frac{1}{25 - 9x^2}\,dx$.

(d) Evaluate $\int \log x\,dx$.

(e) Evaluate $\int \frac{x}{(x+1)(x+2)}dx$.

(f) Evaluate $\int \frac{\cos\sqrt{x}}{\sqrt{x}}dx$.

(g) Evaluate $\int_1^2 \frac{1}{3x - 2}\,dx$.

(h) Find the area bounded by the curve y = sin x and x-axis from $x = 0$ to $x = \pi$.

(i) Find order and degree of differential equation $\frac{d^2y}{dx^2} = \sqrt[4]{1 + \left(\frac{dy}{dx}\right)^2}$

(j) Form a differential equation if y = A sin x + B cos x.

(k) If two unbiased dice are rolled, what is the probability that sum is equal to 9 ?

(l) An unbiased coin is tossed 6 times. Find the probability of getting 2 heads.

2. Attempt any FOUR : **16**

(a) Find the equation of tangent and normal to the curve $4x^2 + 9y^2 = 40$ at point (1, 2).

(b) Find maximum and minimum value of $x^3 - 18x^2 + 96x$.

(c) Show that the radius of curvature at any point on the curve y = a log (sec (x/a)). Where 'a' is constant is ' a sec (x/a).

(d) Evaluate $\int \frac{dx}{x \cdot \sin^2(\log x)}$

(e) Evaluate $\int \frac{x \cdot \sin^{-1}x}{\sqrt{1 - x^2}} dx$.

(f) Evaluate $\int \frac{x^2 + 1}{(x + 1)(x + 2)(x - 3)} dx$.

3. Attempt any FOUR : **16**

(a) Evaluate $\int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}} dx$.

(b) Evaluate $\int_0^{\pi/2} \frac{\cos x}{4 - \sin^2 x} dx$.

(c) Find the area bounded between the parabolas $y^2 = 9x$ and $x^2 = 9y$.

(d) Solve $\frac{dy}{dx} = e^{3x-2y} + x^2e^{-2y}$.

(e) Solve $y^2 + x^2\frac{dy}{dx} = xy\frac{dy}{dx}$.

(f) Solve $x\frac{dy}{dx} - y = x^2 \cos x$.

4. Attempt any FOUR : 16

(a) Evaluate $\int_1^3 \frac{\sqrt{x}}{\sqrt{4-x}+\sqrt{x}}\,dx$.

(b) Evaluate $\int_0^1 \tan^{-1} x\,dx$.

(c) Evaluate $\int \frac{dx}{5 + 4\cos 2x}$.

(d) Solve $\frac{dy}{dx} = (4x + y + 1)^2$.

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

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

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

5. Attempt any FOUR : 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 $\frac{1}{4}$ respectively. What is the probability that

(i) The problem will be solved ?

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

P.T.O.

(b) On an average 10% of the products manufactured by a certain machine are defective. If from these products 4 are chosen at random, find the probability that one of them is defective.

(c) 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 $e^{-1} = 0.3679$)

(d) Evaluate $\int \frac{dx}{4\cos^2 x + 9\sin^2 x}$.

(e) Evaluate $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$.

(f) Find the area of circle $x^2 + y^2 = 25$ by integration.

6. Attempt any FOUR : **16**

(a) A box contains 10 red, 5 white, 5 black balls, two balls are drawn at random. Find the probability that they are not of the same colour.

(b) If a random variable has Poisson's distribution P(2) = P(3), find P(5).

(c) The mean weight of 500 students at a certain college is 50 kg and S.D. is 6 kg. Assuming the weights are normally distributed. Find the no. of students weighing between 40 kg and 50 kg. (Given A(1.67) = 0.4525)

(d) Find the area bounded by the parabola $y = 4 - x^2$ and x-axis.

(e) The perimeter of a rectangle is 100 metres. Find the length of its sides when area of rectangle is maximum.

(f) Find the equation of tangents to the curve $y = x^2 - 2x - 3$, where it cuts x-axis.

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