22232

3 Hours / 100 Marks   Seat No.

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

	Marks

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

(a) Find a point on the curve $y = x^2 - 6x + 8$ where the tangent is parallel to x axis.   **2**

(b) Find the radius of curvature of the curve $y = x^3$ at (1, 1)   **2**

(c) Evaluate $\int \dfrac{x^2}{4 + x^2}\, dx$ **2**

(d) Evaluate $\int \log x\, dx$ **2**

(e) Evaluate $\int\limits_{0}^{\infty} e^{-x}\, dx$ **2**

(f) Evaluate $\int \dfrac{\sin x}{\sin 2x}\, dx$ **2**

(g) Find the area bounded by $y = x^2 - 9$, $x = 0$, $x = 3$ and x-axis.   **2**

(h) Find order & degree of D.E. $\left(\dfrac{d^2y}{dx^2}\right)^{2/3} = \sqrt{y + \dfrac{dy}{dx}}$ **2**

(i) Form a D.E. if $y = a \cos(x + b)$ **2**

(j) A coin is tossed 3 times. What is the probability of getting more than 2 heads ? **2**

(k) If a random variable has a Poisson distribution such that $P(2) = P(3)$, find $P(5)$. **2**

(l) If $P(A) = \dfrac{2}{3}$, $P(B') = \dfrac{3}{4}$, $P(A/B) = \dfrac{4}{5}$, find $P(A \cap B)$ **2**

2. **Attempt any FOUR :** **16**

(a) Find the equation of tangent & normal to the curve $2x^2 - xy + 3y^2 - 18 = 0$ at point (3, 1) **4**

(b) Find maximum & minimum value of the function $y = 2x^3 - 21x^2 + 36x - 20$ **4**

(c) Find radius of curvature of $y = \log(\sin x)$ at $x = \dfrac{\pi}{2}$ **4**

(d) Evaluate $\int \tan^{-1} x\, dx$ **4**

(e) Evaluate $\int \dfrac{\cos x\, dx}{(1+\sin x)(2+\sin x)(3+\sin x)}$ **4**

(f) Evaluate $\int \dfrac{dx}{4+5\cos x}$ **4**

3. **Attempt any FOUR :** **16**

(a) Evaluate $\displaystyle\int_1^5 \dfrac{\sqrt{9-x}}{\sqrt{9-x}+\sqrt{x+3}}\, dx$ **4**

(b) Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{dx}{9+16\cos^2 x}$ **4**

   (c)   Find the area bounded by $y^2 = 4x$ & $x^2 = 4y$ **4**

   (d)   Solve $\dfrac{dy}{dx} = e^{x-y} + x\, e^{-y}$ **4**

   (e)   Solve $\dfrac{dy}{dx} = \sin(x - y)$ **4**

   (f)   Solve $(y^2 - x^2)\, dx - 2xy\, dy = 0$ **4**

4.   **Attempt any FOUR :**   **16**

   (a)   Evaluate $\displaystyle\int_{0}^{\pi/2} \dfrac{dx}{1 + \sqrt{\cot x}}$ **4**

   (b)   Evaluate $\displaystyle\int_{0}^{\pi/4} \log(1 + \tan\theta)\, d\theta$ **4**

   (c)   Find area of circle $x^2 + y^2 = 25$ using integration.   **4**

   (d)   Solve $(e^{4x} + 2xy^2)\, dx + (\cos y + 2x^2 y)\, dy = 0$ **4**

   (e)   Solve $x\dfrac{dy}{dx} + y = x^3$ **4**

   (f)   Solve $(x^2 + 1)\dfrac{dy}{dx} = e^{\tan^{-1}x} - y$ **4**

5.   **Attempt any FOUR :**   **16**

   (a)   Evaluate $\displaystyle\int_{0}^{1} \dfrac{(\tan^{-1}x)^2}{1 + x^2}\, dx$ **4**

   (b)   Evaluate $\displaystyle\int_{0}^{\pi/2} \log(\tan x)\, dx$ **4**

   (c)   Evaluate $\displaystyle\int x\sin x\cos x\, dx$ **4**

    (d)   A card is drawn from a pack, find the probability that the card is a diamond or a face card. **4**

    (e)   If 2% of electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs, 3 bulbs will be defective. **4**

    (f)   From 20 tickets marked 1 to 20, one ticket is drawn at random. Find the probability that marked with multiple of 3 or 5. **4**

6.   **Attempt any FOUR :** **16**

    (a)   In a college hostel there are 75 students out of which 20 students like to drink tea, 40 students like to drink coffee & 20 like neither tea nor coffee. Two students from this hostel came to a canteen. Find the probability that both will order same drink. **4**

    (b)   Fit a Poisson distribution to set of observations : **4**

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

    (c)   If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$, $P(A \cup B) = \frac{1}{2}$, find $P(A \cap B')$ & $P(A/B')$ **4**

    (d)   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. **4**

          (A (2.25) = 0.4878, A(1) = 0.3413)

    (e)   Divide 80 into two parts such that product of one & cube of other is maximum. **4**

    (f)   Find the equation of tangent to curve $x = \frac{1}{t}$, $y = t - \frac{1}{t}$ when t = 2 **4**

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