# 17301

**21819**

**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.

**Marks**

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

a) At what point on the curve $y = e^x$, the slope is 1?

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

c) Evaluate $\int \frac{\cos(\log x)}{x} dx$

d) Evaluate $\int \text{cosec}^2(e^x) \times e^x \, dx$

e) Evaluate $\int x \times a^x \, dx$

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

g) Evaluate $\int_1^2 \frac{dx}{4x-1}$

h) Find the area enclosed by $y = 3x^2$ and the lines $x = 1$, $x = 3$, and $x$-axis.

P.T.O.

**Marks**

i) Find the order and degree of the following differential equation $\frac{d^3y}{dx^3} + \sqrt{1 + \frac{dy}{dx}} = 0$

j) Find integrating factor of $(1 + x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$

k) From a pack of 52 cards, one card is drawn at random. Find the probability of getting a face card.

l) A unbiased coin is tossed 5 times. Find the probability of getting 2 tails.

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

a) Find the equation of the tangent and the normal to the parabola $y^2 = 4x$ at the point (1, 2)

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

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

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

e) Evaluate $\int \frac{\cos x}{\sin^2 x + 10 \sin x + 26} dx$

f) Evaluate $\int \frac{\text{cosec}^2 x}{(1 + \cot x)(3 + \cot x)} dx$

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

a) Evaluate $\int_0^{\pi} \cos^3 x \cdot \sin x \cdot dx$

b) Evaluate $\int_0^{\pi/2} \frac{1}{1 + \cot x} dx$

c) Find the area bounded by the curve $y = x^2$ and the line $y = x$

**Marks**

d) Solve $\frac{dy}{dx} = \sin(x + y)$

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

f) Solve $\frac{dy}{dx} + y \tan x = \sec x$

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

a) Evaluate $\int_0^7 \frac{\sqrt[3]{x}}{\sqrt[3]{x} + \sqrt[3]{7 - x}}\, dx$

b) Evaluate $\int_0^1 x \cdot \tan^{-1} x \quad dx$

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

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

e) Solve $(3x^2 + 6xy^2)dx + (6x^2y + 4y^2)dy = 0$

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

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

a) A and B are two Independent events. From a sample space S, such that P(A) = 0.8, P(B) = 0.6 and P (A ∪ B) = 0.9. Find

(i) P (A ∩ B)

(ii) P (A / B)

b) If 30% of the bulbs produced are defective, find the probability that out of 4 bulbs selected

(i) One is defective

(ii) at the most two are defective

**Marks**

c) Fit a Poisson distribution to the set of observations.

| x : | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|
| y: | 8 | 12 | 20 | 10 | 6 | 4 |

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

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

f) Solve $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2$

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

a) A bag contains 20 tickets numbered from 1 to 20. One ticket is drawn at random. Find the probability that it is numbered with multiple of 3 or 4.

b) The chance of two students to win a competition are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If they participate in the same condition, what is the probability that at least one will win?

c) I.Q.'s are normally distributed with mean 100 and standard deviation 15. Find the probability that a randomly selected person has

(i) An I.Q more than 130

(ii) An I.Q. between 85 and 115.

Given $\begin{bmatrix} Z = 2, \text{Area} = 0.4772 \\ Z = 1, \text{Area} = 0.3413 \end{bmatrix}$

d) The equation of the tangent at the point (2,3) on the curve $y = ax^3 + b$, is $y = 4x - 5$. Find the values of $a$ and $b$.

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

f) Find the area bounded by the parabolas $y^2 = 9x$ and $x^2 = 9y$.