

# 17301

**13141**

**3 Hours / 100 Marks**

Seat No.

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*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 the point on the curve  $y = 3x - x^2$  at which slope is  $-5$ .

b) Find the radius of curvature of the curve

$$y = \log(\sin x) \text{ at } x = \frac{\pi}{2}$$

c) Integrate w.r.to  $x$  of  $\sqrt{1 + \cos 2x}$

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

P.T.O.

- e) Evaluate  $\int \frac{dx}{x(x+1)}$
- f) Evaluate  $\int \tan^{-1} x \, dx$
- g) Evaluate  $\int_1^2 \frac{dx}{3x-2}$
- h) Find the area contained by the curve  $y = 1 + x^3 + 2 \sin x$  from  $x = 0$  to  $x = \pi$ .
- i) Find the order and degree of the

$$\text{D.E. } \frac{d^2y}{dx^2} = \sqrt{y - \frac{dy}{dx}}$$

- j) Form a differential equation if  $y = A \sin x + B \cos x$ .
- k) From a pack of 52 cards one is drawn at random. Find the probability of getting a king.
- l) An unbiased coin is tossed 5 times. Find the probability of getting 3 heads.

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

**16**

- a) Find the equation of the tangent and normal to the curve  $13x^3 + 2x^2y + y^3 = 1$  at  $(1, -2)$
- b) A beam is bent in the form of the curve  $y = 2 \sin x - \sin 2x$ . Find the radius of curvature of the beam at this point at

$$x = \frac{\pi}{2}.$$

c) Find the maximum and minimum values of  $x^3 - 18x^2 + 96x$ .

d) Evaluate  $\int \frac{1 - \tan x}{1 + \tan x} dx$

e) Evaluate  $\int \sin^3 x dx$

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

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

16

a) Evaluate  $\int_0^4 \frac{dx}{\sqrt{4x-x^2}}$

b) Evaluate  $\int_0^5 \frac{\sqrt{9-x} dx}{\sqrt{9-x} + \sqrt{x+4}}$

c) Find the area of region included between the parabola  $y = x^2 + 1$  and the line  $y = 2x + 1$ .

d) Solve the D.E.  $x(1+y^2) dx + y(1+x^2) dy = 0$

e) Solve the D.E.  $(4x+y)^2 \frac{dy}{dx} = 1$

f) Solve the D.E.  $x(x+y) dy - y^2 dx = 0$

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

a) Evaluate  $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1 + \sqrt{\cot x}} dx$

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

c) Find the area of the circle  $x^2 + y^2 = 16$  by integration.

d) Solve the D.E.  $\frac{dy}{dx} + y \tan x = \cos^2 x$

e) Solve the D.E.  $(e^x + 2xy^2 + y^3) dx + (a^y + 2x^2y + 3xy^2) dy = 0$

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

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

a) A room has 3 electric lamps. From a collection of 15 electric bulbs of which only 10 are good, 3 are selected at random and put in the lamps. Find the probability that the room is lighted by at least one of the bulbs.

b) If 20% of the bolts produce by a machine are defective. Find the probability that out of 4 bolts drawn

i) One is defective

ii) At most two are defective.

- c) 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.

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

e) Evaluate  $\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$

f) Solve the D.E.  $\frac{dy}{dx} + \frac{y}{x} = y^2$

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

16

a) If  $P(A) = \frac{1}{5}$ ,  $P(B') = \frac{3}{5}$  and  $P\left(\frac{A}{B}\right) = \frac{3}{4}$

Find  $P(A \cap B)$  and  $P\left(\frac{B}{A}\right)$

- b) Using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards atleast one in 104 consecutive trials.

- c) In a sample of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal find
- How many students score between 12 and 15 ?
  - How many students score above 18 ?
- Given     $A(0.8) = 0.2881$   
           $A(0.4) = 0.1554$   
           $A(1.6) = 0.4452$
- d) A manufacturer can sell  $x$  items at price of Rs.  $(330 - x)$  each. The cost of producing  $x$  items in Rs. is  $x^2 + 10x + 12$ . How many items must be sold so that his profit is maximum.
- e) Find the equation of the tangents to the curve  $y = x^2 - 2x - 3$ , where it cuts X-axis.
- f) Find the area of the region lying between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ .
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