

22206

21718

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Figures to the right indicate full marks.
  - (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.

**Marks**

1. Attempt any FIVE of the following :

10

- (a) State whether the function  $f(x) = \frac{a^x + a^{-x}}{2}$  is even or odd.
- (b) If  $f(x) = x^2 + 6x + 10$ , find  $f(2) + f(-2)$ .
- (c) If  $y = \log(x^2 + 2x + 5)$ , find  $\frac{dy}{dx}$ .
- (d) Evaluate :  $\int \frac{1}{\sin^2 x \cos^2 x} dx$ .
- (e) Find the area enclosed by the curve  $y = 3x^2$ ,  $x$ -axis and the ordinates  $x = 1$ ,  $x = 3$ .
- (f) An unbiased coin is tossed 5 times. Find the probability of getting a head.
- (g) Evaluate :  $\int x \cos x dx$ .

**2. Attempt any THREE of the following :****12**

- (a) If  $e^x + e^y = e^{x+y}$ , find  $\frac{dy}{dx}$ .
- (b) If  $x = a(\theta + \sin \theta)$ ,  $y = a(1 - \cos \theta)$ , find  $\frac{dy}{dx}$  at  $\theta = \frac{\pi}{2}$ .
- (c) Find the maximum and minimum values of  $y = 2x^3 - 3x^2 - 36x + 10$ .
- (d) A telegraph wire hangs in the form of a curve  $y = a \log \left( \sec \left( \frac{x}{a} \right) \right)$  where 'a' is constant. Show that radius of curvature at any point is  $a \sec \left( \frac{x}{a} \right)$ .

**3. Attempt any THREE of the following :****12**

- (a) Find the equation of tangent and normal to the curve  $y = 2x - x^2$  at  $(2, 0)$ .
- (b) Differentiate  $(\sin x)^{\tan x}$  w.r.t.  $x$ .
- (c) If  $Y = \sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}$ , find  $\frac{dy}{dx}$ .
- (d) Evaluate :  $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$ .

**4. Attempt any THREE of the following :****12**

- (a) Evaluate :  $\int \frac{1}{\sqrt{1-x^2} (\sin^{-1} x)^2} dx$

(b) Evaluate :  $\int \frac{1}{5 + 4 \cos x} dx$

(c) Evaluate :  $\int \frac{x}{1 + \cos 2x} dx$

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

(e) Evaluate :  $\int_0^{\pi/2} \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}} dx$

5. Attempt any TWO of the following :

12

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

(b) Attempt the following :

(i) Form the D.E. by eliminating the arbitrary constants if

$$y = A \cos 3x + B \sin 3x.$$

(ii) Solve :  $x(1 + y^2)dx + y(1 + x^2)dy = 0$ .

(c) A particle starting with velocity 6 m/sec has an acceleration  $(1 - t^2)$  m/sec<sup>2</sup>, when does it first come to rest ? How far has it then travelled ?

6. Attempt any TWO of the following :

12

(a) Attempt the following :

(i) A person fires 10 shots at target. The probability that any shot will hit the target  $3/5$ . Find the probability that the target is hit exactly 5 times.

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- (ii) If 20% of the bolts produce by a machine are defective. Find the probability that out of 4 bolts drawn,
- (1) one is defective.
  - (2) at the most two are defective.
- (b) A company manufacture electric motors. The probability that an electric motor is defective is 0.01. What is the probability that a sample of 300 electric motors will contains exactly 5 defective motors ? (Given  $e^{-3} = 0.0498$ )
- (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
- (1) how many students score above 18 ?
  - (2) how many students score between 12 and 15 ?

[Given :  $A(0.4) = 0.1554$ ,  $A(0.8) = 0.2881$ ,  $A(1.6) = 0.4452$ ]

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