

11819

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) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) 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) Test whether the function is even or odd if  $f(x) = x^3 + 4x + \sin x$ .
- (b) If  $f(x) = x^2 + 5x + 1$  then find  $f(0) + f(1)$ .
- (c) Find  $dy/dx$  if  $y = x^n + a^x + e^x + \sin x$ .
- (d) Evaluate  $\int x e^x dx$ .
- (e) Evaluate  $\int \tan^2 x dx$ .
- (f) Find the area bounded by the curve  $y = 2x$ ,  $x$ -axis and the co-ordinates  $x = 1$ ,  $x = 3$ .
- (g) If the coin is tossed 5 times, find the probability of getting head.

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

- (a) Find  $\frac{dy}{dx}$  if  $x \cdot \log y + y \cdot \log x = 0$ .
- (b) If  $x = a \cdot \sec t$ ,  $y = b \cdot \tan t$ , find  $\frac{dy}{dx}$  at  $t = \pi/2$ .
- (c) The rate of working of an engine is given by the expression  $10V + \frac{4000}{V}$ , where 'V' is the speed of the engine. Find the speed at which the rate of working is the least.
- (d) A telegraph wire hangs in the form of the curve  $y = a \cdot \log [\sec (x/a)]$  where 'a' is constant. Show that the radius of curvature at any point is  $a \cdot \sec(x/a)$ .

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

- (a) Find the equation of tangent and normal to the curve  $4x^2 + 9y^2 = 40$  at (1, 2).
- (b) If  $\log (\sqrt{x^2 + y^2}) = \tan^{-1} \left( \frac{y}{x} \right)$ , find  $\frac{dy}{dx}$ .
- (c) If  $y = \log (x^2 e^x)$ , find  $\frac{dy}{dx}$ .
- (d) Evaluate  $\int \frac{e^{m \sin^{-1} x}}{\sqrt{1-x^2}} dx$ .

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

- (a) Evaluate  $\int \frac{1}{\sqrt{x^2 + 4x + 13}} dx$ .
- (b) Evaluate  $\int \frac{1}{5 + 4 \cos x} dx$
- (c) Evaluate  $\int x \cdot \log (1 + x) dx$

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

(e) Evaluate  $\int_0^4 \frac{\sqrt[3]{x+5}}{\sqrt[3]{x+5} + \sqrt[3]{9-x}} dx$ .

**5. Attempt any TWO of the following :**

**12**

- (a) Find the area bounded by parabola  $y^2 = 9x$  and  $x^2 = 9y$ .
- (b) Attempting the following :
- (i) Form the differential equation by eliminating the arbitrary constants if  $y = A \cos 3x + B \sin 3x$ .
- (ii) Solve  $e^{x+y}dx + e^{2y-x}dy = 0$ .
- (c) A body moves according to the law of motion is given by  $\frac{d^2x}{dt^2} = 3t^2$ . Find its velocity at  $t = 1$  &  $v = 2$ .

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

**12**

- (a) Attempt the following :
- (i) On an average 2% of the population in an area suffer from T. B. What is the probability that out of 5 persons chosen at random from this area, atleast two suffer from T. B. ?
- (ii) 10% of the component manufactured by company are defective. If twelve components selected at random, find the probability that atleast two will be defective.

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- (b) The number of road accidents met with by taxi drivers follow Poisson distribution with mean 2 out of 5000 taxi in the city, find the number of drivers.
- (i) Who does not meet an accident.
  - (ii) Who met with an accidents more than 3 items. (Given  $e^{-2} = 0.1353$ )
- (c) Weight of 4000 students are found to be normally distributed with mean 50 kgs and standard deviation 5 kgs. Find the number of students with weights
- (i) less than 45 kgs
  - (ii) between 45 and 60 kgs
- (Given : For a standard normal variate  $z$  area under the curve between  $z = 0$  and  $z = 1$  is 0.3413 and that between  $z = 0$  and  $z = 2$  is 0.4772)
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