

# 22206

**21222**

**3 Hours / 70 Marks**

Seat No. 

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15 minutes extra for each hour

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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. Solve any FIVE of the following:**

**10**

- a) If  $f(x) = \log(\sin x)$ . Then find  $f(\pi/2)$ .
- b) Find Range of the function if  $f(x) = 3x^2 - 5x - 7$  and  $-3 \leq x < 2$ .
- c) If  $y = \log_{10} x + 3^x$ . Then find  $\frac{dy}{dx}$ .
- d) Evaluate :  $\int \frac{\sin x}{\cos^2 x} dx$
- e) Find area under the curve  $y = e^x$  from the ordinates  $x = 0$  and  $x = 1$ .
- f) Evaluate :  $\int_0^{\pi/2} \sin x \cdot \cos x \cdot dx$
- g) If the coin is tossed three times. Find the probability of getting exactly two Heads.

P.T.O.

2. Solve any THREE of the following:

12

- a) If  $x^2 + y^2 = 4xy$ , then find  $\frac{dy}{dx}$  at  $(2, -1)$ .
- b) If  $x = 3at^2$ ,  $y = 2at^3$ . Find  $\frac{dy}{dx}$ .
- c) The equation of the tangent at the point  $(2, 3)$  on the curve  $y = ax^3 + b$  is  $y = 4x - 5$ . Find value of 'a' and 'b'.
- d) Find Radius of curvature of the curve  $y^2 = 4ax$  at  $(a, 2a)$ .

3. Solve any THREE of the following:

12

- a) A manufacture can sell  $x$  ( $x \geq 0$ ) items at price is of ₹  $(330 - x)$  each. The cost of producing  $x$  items in ₹  $x^2 + 10x + 12$ . How many items must be sold so that his profit is maximum.
- b) If  $y = \tan^{-1}\left(\frac{2x}{1+15x^2}\right)$  find  $\frac{dy}{dx}$ .
- c) Evaluate :  $\int \frac{\sin(\sqrt{x})}{\sqrt{x}} dx$
- d) If  $y = (\sin x)^{\tan x}$ . Find  $\frac{dy}{dx}$ .

4. Solve any THREE of the following:

12

- a) Evaluate :  $\int \frac{1}{\sqrt{13-6x-x^2}} dx$
- b) Evaluate :  $\int \frac{1}{3+2\sin x} dx$
- c) Evaluate :  $\int e^x \cdot \sin 4x \cdot dx$
- d) Evaluate :  $\int \frac{\log x}{x \cdot (2 + \log x) (3 + \log x)} dx$
- e) Evaluate :  $\int_0^5 \frac{\sqrt{9-x}}{\sqrt{9-x} + \sqrt{x+4}} dx$

**5. Solve any TWO of the following:****12**

- a) Find the area bounded by the parabola  $y^2 = 4x$  and  $x^2 = 4y$ .
- b) i) Solve :  $x^2y dx - (x^3 + y^3)dy = 0$   
ii) From a differential equation of  $y = a \cos 4x + b \sin 4x$ .
- c) Acceleration of a moving particle at the end of 't' second. From the start of it's motion is  $(5 - 2t)$  m/s<sup>2</sup>. Find it's velocity at the end of 3 seconds and distance travelled by it during the period. If it's intial velocity is 4 m/s.

**6. Solve any TWO of the following:****12**

- a) If 20% of the bolts produces by a machine are defective. Find the probability that out of 4 bolts drawn.  
i) One is defective  
ii) at most two are defective
- b) If the probability of a bad reaction from the certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. (Given  $e^2 = 7.4$ )
- c) In a sample of 1000 cases the mean of certain test is 14 and S.D is 2.5. Assuming the distribution to be normal. Find  
i) How many students score between 12 and 15?  
ii) How many students score above 18?

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

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