

# BOARD QUESTION PAPER : JULY 2016

**Notes:**

- i. All questions are compulsory.
- ii. Figures to the right indicate full marks.
- iii. Answer to every question must be written on a new page.
- iv. L.P.P. problem should be solved on graph paper.
- v. Log table will be provided on request.
- vi. Write answers of Section – I and Section – II in one answer book.

**Section – I****Q.1. Attempt any SIX of the following:****[12]**

- i. Evaluate:  $\int \frac{e^{3x}}{1+e^{3x}} dx$  (2)
- ii. The price P for demand D is given as  $P = 183 + 120D - 3D^2$ , find D for which price is increasing. (2)
- iii. Write the truth value of the negation of each of the following statements:
  - (a) The Sun sets in the East
  - (b)  $\cos^2 \theta + \sin^2 \theta = 1$ , for all  $\theta \in \mathbb{R}$  (2)
- iv. Simplify the following:
 
$$\begin{bmatrix} 1 & 2 & 0 & -1 & 5 & -2 \\ 0 & -1 & 3 & -3 & -4 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$
 (2)
- v. Examine the continuity of f at  $x = 1$ , if  $f(x) = 5x - 3$ , for  $0 \leq x < 1$   
 $= x^2 + 1$ , for  $1 \leq x < 2$  (2)
- vi. Find  $\frac{dy}{dx}$ , if  $y = x^{e^x}$  (2)
- vii. If  $A = \begin{bmatrix} 2 & a & 2 \\ 5 & 7 & 3 \end{bmatrix}$  is a singular matrix, find the value of 'a'. (2)
- viii. Evaluate:  $\int \frac{1}{\sqrt{x^2 - 4x + 2}} dx$  (2)

**Q.2. (A) Attempt any TWO of the following:****[6][14]**

- i. Show that the following statement pattern is contingency:  
 $(\sim p \vee q) \rightarrow [p \wedge (q \vee \sim q)]$  (3)
- ii. If  $f(x) = \frac{e^{2x} - 1}{ax}$ , for  $x < 0$ ,  $a \neq 0$   
 $= 1$ , for  $x = 0$   
 $= \frac{\log(1 + 7x)}{0 \cdot bx}$ , for  $x > 0$ ,  $b \neq 0$   
 is continuous at  $x = 0$ , then find a and b. (3)

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iii. If  $x^y = e^{x^{-y}}$ , then show that

$$\frac{dy}{dx} = \frac{\log x}{1 + \log x^{-2}} \quad (3)$$

(B) Attempt any TWO of the following: [8]

i. Evaluate:  $\int_0^1 x \cdot \tan^{-1} x \, dx$  (4)

ii. If  $A = \begin{pmatrix} 1 & -1 & 2 \\ 1 & 0 & 3 \end{pmatrix}$ , verify that  $A(\text{adj } A) = (\text{adj } A)A = |A| \cdot I$  (4)

iii. A manufacturer can sell  $x$  items at a price of ₹  $(280 - x)$  each. The cost of producing  $x$  items is ₹  $(x^2 + 40x + 35)$ . Find the number of items to be sold so that the manufacturer can make maximum profit. (4)

Q.3. (A) Attempt any TWO of the following: [6][14]

i. Find  $k$ , if the function  $f$  is continuous at  $x = 0$ , where  $f(x) = \frac{(e^x - 1)(\sin x)}{x^2}, x \neq 0$   
 $= k, x = 0$  (3)

ii. Differentiate  $\log(1 + x^2)$  w.r.t.  $\cot^{-1} x$  (3)

iii. Using the Venn diagram, examine the logical equivalence of the following statements:  
 a. Some politicians are actors.  
 b. There are politicians who are actors.  
 c. There are politicians who are not actors. (3)

(B) Attempt any TWO of the following: [8]

i. Find the volume of the solid generated by the complete revolution of the ellipse  $\frac{x^2}{9} + \frac{y^2}{25} = 1$  about Y-axis. (4)

ii. Evaluate:  $\int \frac{x^2}{x^4 + 5x^2 + 6} dx$  (4)

iii. The total cost of manufacturing  $x$  articles is  $C = (47x + 300x^2 - x^4)$ . Find  $x$ , for which average cost is  
 a. increasing  
 b. decreasing. (4)