

## BOARD QUESTION PAPER : MARCH 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. If  $y = (\sin x)^x$ , find  $\frac{dy}{dx}$ . (2)
- ii. If  $A = \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix}$  show that  $A^2 - 2A$  is a scalar matrix. (2)
- iii. Write the negation of the following statements:
  - (a)  $\forall y \in \mathbb{N}, y^2 + 3 \leq 7$
  - (b) If the lines are parallel then their slopes are equal. (2)
- iv. The total revenue  $R = 720x - 3x^2$  where  $x$  is number of items sold. Find  $x$  for which total revenue  $R$  is increasing. (2)
- v. Evaluate:  $\int \frac{\sec^2 x}{\tan^2 x + 4} dx$  (2)
- vi. Find  $\frac{dy}{dx}$ , if  $y = \cos^{-1}(\sin 5x)$  (2)
- vii. Discuss the continuity of function  $f$  at  $x = 0$   
 Where  $f(x) = \frac{\sqrt{4+x} - 2}{3x}$ , for  $x \neq 0$   
 $= \frac{1}{12}$ , for  $x = 0$  (2)
- viii. State which of the following sentences are statements. In case of statement, write down the truth value:
  - (a) Every quadratic equation has only real roots.
  - (b)  $\sqrt{-4}$  is a rational number. (2)

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

- i. Solve the following equations by the inversion method:  
 $2x + 3y = -5$  and  $3x + y = 3$  (3)
- ii. Find  $x$  and  $y$ , if  $\begin{pmatrix} 1 & 2 & 0 \\ 0 & -1 & 3 \end{pmatrix} \begin{pmatrix} -3 & -4 \\ -3 & -4 \end{pmatrix} \begin{pmatrix} 1 & 5 & -2 \\ 4 & & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix}$  (3)
- iii. Evaluate:  $\int \tan^{-1} x dx$ . (3)

- (B) Attempt any TWO of the following:** [8]
- i. (a) Express the truth of each of the following statements using Venn diagram.
    - (1) All teachers are scholars and scholars are teachers.
    - (2) If a quadrilateral is a rhombus then it is a parallelogram.
  - (b) Write converse and inverse of the following statement:  
 "If Ravi is good in logic then Ravi is good in Mathematics." (4)
  - ii. Find the area of the region bounded by the lines  $2y + x = 8$ ,  $x = 2$  and  $x = 4$ . (4)
  - iii. Evaluate:  $\int \frac{\sqrt[9]{12-x}}{\sqrt[3]{x+\sqrt[3]{12-x}}} dx$  (4)

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

- i. If  $f(x) = \frac{e^{2x}-1}{ax}$ , for  $x < 0$ ,  $a \neq 0$   
 $= 1$ , for  $x = 0$   
 $= \frac{\log(1+7x)}{bx}$ , for  $x > 0$ ,  $b \neq 0$   
 Is continuous at  $x = 0$  then find a and b. (3)
  - ii. If the function f is continuous at  $x = 0$ , then find  $f(0)$   
 where  $f(x) = \frac{\cos 3x - \cos x}{x}$ ,  $x \neq 0$  (3)
  - iii. If  $f'(x) = 4x^3 - 3x^2 + 2x + k$  and  $f(0) = 1$ ,  $f(1) = 4$ , find  $f(x)$ . (3)
- (B) Attempt any TWO of the following:** [8]
- i. Find MPC (Marginal Propensity to Consume) and APC (Average Propensity to Consume) if the expenditure  $E_c$  of a person with income I is given as  $E_c = (0.0003) I^2 + (0.075) I$  when  $I = 1000$ . (4)
  - ii. Cost of assembling  $x$  wallclocks is  $\frac{x^3}{5} - 40x^2$  and labour charges are  $500x$ . Find the number of wallclocks to be manufactured for which marginal cost is minimum. (4)
  - iii. If  $\cos^{-1} \frac{x^2 - y^2}{x^2 + y^2} = 2k$ ,  
 show that  $y \frac{dy}{dx} = x \tan^2 k$ . (4)