

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 $A = \begin{bmatrix} 1 & 3 \\ 3 & 1 \end{bmatrix}$ 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 $x \neq 0$

$$= \frac{1}{12}, \text{ for } x = 0$$
 (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 $\begin{Bmatrix} 1 & 2 & 0 \\ 3 & -1 & 3 \end{Bmatrix} \begin{Bmatrix} 1 & 5 & -2 \\ -3 & -4 & 4 \end{Bmatrix} \begin{Bmatrix} 1 \\ 2 \\ 1 \end{Bmatrix} = \begin{Bmatrix} x \\ y \end{Bmatrix}$ (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: $\int \frac{\sqrt{12-x}}{\sqrt[3]{x+3}\sqrt{2-x}} dx$ (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 $f(x) = \frac{\cos 3x - \cos x}{x^2}$, $x \neq 0$ (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 $\left(\frac{x^3}{3} - 40x^2 \right)$ and labour charges are $500x$. Find the number of wallclocks to be manufactured for which marginal cost is minimum. (4)
- iii. If $\cos^{-1} \left(\frac{x^2 - y^2}{x^2 + y^2} \right) = 2k$,
 show that $y \frac{dy}{dx} = x \tan^2 k$. (4)