

**BOARD QUESTION PAPER : MARCH 2014****Note:**

- i. All questions are compulsory.
- ii. Figures to the right indicate full marks.
- iii. Graph papers are not necessary for L.P.P. Only rough sketch of the graph is expected.
- iv. Answers to both the sections should be written in the separate answer books.
- v. Answer to every new question must be written on a new page.

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

i. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 4 & 3 \\ -2 & 5 & 0 \end{bmatrix}$

then find $2A + 3B$.**(2)**

- ii. If the function f is continuous at $x = 1$, then find $f(1)$.

Where $f(x) = \frac{x^2 - 3x + 2}{x - 1}$ for $x \neq 1$.

(2)

- iii. If $x = \tan^{-1}t$ and $y = t^3$, find $\frac{dy}{dx}$.

(2)

- iv. Evaluate: $\int \sin^2 x dx$.

(2)

- v. Write negation of the following statements:

a. Chetan has black hair and blue eyes.

b. $\exists x \in \mathbb{R}$ such that $x^2 + 3 > 0$.

(2)

- vi. If $A = \begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then find $|AB|$.

(2)

- vii. Evaluate: $\int \frac{dx}{4 - 9x^2}$

(2)

- viii. If the function f is continuous at $x = 2$, then find 'k'

where $f(x) = \frac{x^2 + 5}{x - 1}$, for $1 < x \leq 2$

$= kx + 1$, for $x > 2$

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

- i. If $x^y = e^{x-y}$, show that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$

(3)

- ii. If $\sin y = x \sin(a + y)$

prove that $\frac{dy}{dx} = \frac{\sin^2(a + y)}{\sin a}$

(3)

- iii. Discuss extreme values of the function $f(x) = x \log x$.

(3)



(B) Attempt any TWO of the following:

i. Discuss the continuity of the function f at $x = 0$,

$$\text{where } f(x) = \frac{5^x + 5^{-x} - 2}{\cos 2x - \cos 6x}, \quad \text{for } x \neq 0$$

$$= \frac{1}{8}(\log 5)^2, \quad \text{for } x = 0 \quad (4)$$

ii. The expenditure E_C of a person with income I is given by $E_C = (0.000035) I^2 + (0.045) I$
Find marginal propensity to consume (MPC) and average propensity to consume (APC)
when $I = 5000$. (4)

iii. Evaluate: $\int x \cot^{-1} x \, dx$ (4)

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

i. If p : It is a day time.
 q : It is warm.

Given the verbal statements for the following symbolic statements:

- a. $p \wedge \sim q$
- b. $p \vee q$
- c. $p \leftrightarrow q$ (3)

ii. Using the truth table, examine whether the statement pattern $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$ is a tautology, a contradiction or a contingency. (3)

iii. The cost C of producing x articles is given as
 $C = x^3 - 16x^2 + 47x$.
For what values of x will the average cost be decreasing? (3)

(B) Attempt any TWO of the following:

i. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 3 & 1 \end{bmatrix}$ then find A^{-1} by using elementary transformation. (4)

ii. Evaluate: $\int_0^3 \frac{dx}{x + \sqrt{9 - x^2}}$ (4)

iii. Find the volume of a solid obtained by the complete revolution of the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$
about X - axis. (4)