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: $\int \frac{e^{3x}}{e^{3x}+1} dx$ (2)

ii. The price P for demand D is given as
$P = 183 + 120\,D - 3D^2$, 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 $\theta \in R$ (2)

iv. Simplify the following:

$$\left\{3\begin{bmatrix}1 & 2 & 0\\ 0 & -1 & 3\end{bmatrix} - \begin{bmatrix}1 & 5 & -2\\ -3 & -4 & 4\end{bmatrix}\right\}\begin{bmatrix}1\\2\\1\end{bmatrix}$$ (2)

v. Examine the continuity of f at $x = 1$, if
$f(x) = 5x - 3$, for $0 \le x \le 1$
$= x^2 + 1$, for $1 \le x \le 2$ (2)

vi. Find $\frac{dy}{dx}$, if $y = x^{e^x}$ (2)

vii. If A = $\begin{bmatrix}1 & 2 & 3\\ 2 & a & 2\\ 5 & 7 & 3\end{bmatrix}$ 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 $x < 0$, $a \ne 0$
$= 1$, for $x = 0$
$= \frac{\log(1+7x)}{bx}$, for $x > 0$, $b \ne 0$
is continuous at $x = 0$, then find a and b. (3)

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

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

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

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

ii. If A = $\begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, verify that

A (adj A) = (adj A) A= |A| . 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

$$f(x) = \frac{(e^x - 1)(\sin x)}{x^2}, \quad x \neq 0$$
$$= k, \quad x = 0$$ (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 $\frac{x^2}{36} + \frac{y^2}{25} = 1$ 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)