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) $\forall\, y \in N, y^2 + 3 \leq 7$
(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 $\left\{3\begin{bmatrix} 1 & 2 & 0 \\ 0 & -1 & 3 \end{bmatrix} - \begin{bmatrix} 1 & 5 & -2 \\ -3 & -4 & 4 \end{bmatrix}\right\}\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$ (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: $\int_3^9 \frac{\sqrt[3]{12-x}}{\sqrt[3]{x}+\sqrt[3]{12-x}}\,dx$ (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 $f(x) = \frac{\cos 3x - \cos x}{x^2}$, $x \neq 0$ (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)