



BOARD QUESTION PAPER : JULY 2018

MATHEMATICS AND STATISTICS – I

Notes:

- i. All questions are compulsory.
- ii. Figures to the right indicate full marks.
- iii. Graph paper is necessary for L.P.P.
- iv. Use of logarithmic table is allowed.
- v. Answers to the question in Section – I and Section – II should be written in two separate answer books.
- vi. Question from Section – I attempted in the answer book of Section – II and vice-versa will not be assessed / not be given any credit.
- vii. Answer to every question must be written on a new page.

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

- i. p: It is a day time, q : It is warm
Give the verbal statements for the following symbolic statements :
a. $p \wedge \sim q$ b. $p \rightarrow q$ (2)
- ii. Express the truth of each of the following statements using Venn diagrams:
a. No circles are polygons
b. Some quadratic equations have equal roots. (2)
- iii. Find the values of x and y if

$$2 \begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$
(2)
- iv. Find $\frac{dy}{dx}$; if $x = \sin^3 \theta$, $y = \cos^3 \theta$ (2)
- v. Find $\frac{dy}{dx}$; if $y = \cos^{-1}(2x\sqrt{1-x^2})$ (2)
- vi. Evaluate: $\int x \cdot \log x \, dx$ (2)
- vii. The cost C of producing x articles is given as $C = x^3 - 16x^2 + 47x$. For what values of x, the average cost is decreasing? (2)
- viii. Evaluate: $\int_0^{\frac{\pi}{4}} \frac{1}{1+x^2} dx$ (2)

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

- i. Solve the following equations by reduction method:
 $x + y + z = 6$, $3x - y + 3z = 10$, $5x + y - 4z = 3$ (3)
- ii. Evaluate : $\int \frac{2x+1}{(x+1)(x-2)} dx$ (3)
- iii. Evaluate : $\int_0^1 x(1-x)^{\frac{3}{2}} dx$ (3)

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

i. Using the rules of negation, write the negation of the following :

a. $p \wedge (q \rightarrow r)$

(b) $\sim p \vee \sim q$

(4)ii. If the function f is continuous at $x = 2$ and $x = 4$ then find the values of a and b .

Where $f(x) = x^2 + ax + b, x < 2$

$= 3x + 2, \quad 2 \leq x \leq 4$

$= 2ax + 5b, \quad 4 \leq x$

(4)iii. A manufacturing company produces x items at the total cost of ₹ $(180 + 4x)$. The demand function of this product is $P = (240 - x)$ Find x for which profit is increasing.**(4)****Q.3. (A) Attempt any TWO of the following:****(6)[14]**i. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 7 & 1 \\ 2 & 5 \end{bmatrix}$, verify that $|AB| = |A| \cdot |B|$ **(3)**ii. Evaluate : $\int \frac{1}{x \cdot [(\log x)^2 + 4]} dx$ **(3)**iii. Find the volume of solid generated by rotating the area bounded by $x^2 + y^2 = 36$ and the lines $x = 0, x = 3$ about X - axis.**(3)****(B) Attempt any TWO of the following:****(8)**i. If f is continuous at $x = 0$, then find $f(0)$. Where $f(x) = \frac{(3^{\sin x} - 1)^2}{x \cdot \log(x + 1)}, x \neq 0$ **(4)**ii. If $x^7 \cdot y^9 = (x + y)^{16}$, then show that $\frac{dy}{dx} = \frac{y}{x}$ **(4)**iii. In a firm the cost function for output x is given as $C = \frac{x^3}{3} - 20x^2 + 70x$. Find the output for which marginal cost (C_m) is minimum.**(4)**