

BOARD QUESTION PAPER : MARCH 2018

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. Draw Venn diagram for the truth of the following statements: (2)
 - a. All rational numbers are real numbers.
 - b. Some rectangles are squares.
- ii. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ using elementary transformations. (2)
- iii. Examine the continuity of $f(x) = x^2 - x + 9$ for $x \leq 3$
 $= 4x + 3$ for $x > 3$, at $x = 3$ (2)
- iv. Find $\frac{dy}{dx}$, if $y = \cos^{-1}(\sin 5x)$ (2)
- v. The price P for demand D is given as $P = 183 + 120D - 3D^2$. Find D for which the price is increasing. (2)
- vi. Evaluate: $\int \frac{1}{x(3 + \log x)} dx$ (2)
- vii. Find cofactors of the elements of the matrix $A = \begin{bmatrix} -1 & 2 \\ - & \end{bmatrix}$ (2)
- viii. Evaluate: $\int \frac{1}{9x^2 + 49} dx$ (2)

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

- i. Find k, if $f(x) = \frac{\log(1 + 3x)}{5x}$ for $x \neq 0$
 $= k$ for $x = 0$
is continuous at $x = 0$. (3)
- ii. Examine whether the following statement pattern is tautology, contradiction or contingency:
 $p \vee \sim(p \wedge q)$ (3)
- iii. If $x = \cos^2 \theta$ and $y = \cot \theta$ then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$. (3)

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

- i. The sum of three numbers is 6. If we multiply the third number by 3 and add it to the second number we get 11. By adding first and third numbers we get a number, which is double than the second number. Use this information and find a system of linear equations. Find these three numbers using matrices. (4)
- ii. Find the area of the region bounded by the parabola $y^2 = 16x$ and the line $x = 4$. (4)
- iii. The consumption expenditure E_c of a person with the income x , is given by $E_c = 0.0006x^2 + 0.003x$. Find MPC, MPS, APC and APS when the income $x = 200$. (4)

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

- i. Discuss continuity of $f(x) = \frac{x^3 - 64}{\sqrt{x^2 + 9} - 5}$ for $x \neq 4$
 $= 10$ for $x = 4$
at $x = 4$ (3)

ii. Find $\frac{dy}{dx}$, if $e^x + e^y = e^{x-y}$ (3)

iii. Using truth table show that $\sim(p \rightarrow \sim q) \equiv p \wedge q$ (3)

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

i. Evaluate: $\int \frac{\sin x}{\sqrt{\cos^2 x - 2 \cos x - 3}} dx$ (4)

ii. The total cost function of a firm is $C = x^2 + 75x + 1600$ for output x . Find the output (x) for which average cost is minimum. Is $C_A = C_M$ at this output? (4)

iii. Evaluate: $\int_1^2 \frac{1}{(x+1)(x+3)} dx$ (4)

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Section – I

Question 1 to 3 (based on section I) are given in our book *STD XII (COMMERCE) MATHEMATICS AND STATISTICS - I*

Section – II

Q.4. Attempt any SIX of the following:

[12]

- A shop valued at ` 2,40,000 is insured for 75% of its value. If the rate of premium is 90 paise percent, find the premium paid by the owner of the shop. (2)
- Find the Age-Specific Death Rate (Age-SDR) for the following data: (2)

Age groups (in years)	Number of persons (in' 000)	Number of deaths
0 – 10	11	240
10 – 20	12	150
20 – 60	9	125
60 and above	2	90

(2)

- If $\sum d_i^2 = 25$, $n = 6$ find rank correlation coefficient where d_i is the difference between the ranks of i^{th} values. (2)

- The following table gives the ages of husbands and wives:

Age of wives (in years)	Age of husbands (in years)			
	20 – 30	30 – 40	40 – 50	50 – 60
15 – 25	5	9	3	–
25 – 35	–	10	25	2
35 – 45	–	1	12	2
45 – 55	–	–	4	16
55 – 65	–	–	–	4

- Find: a. The marginal frequency distribution of the age of husbands.
b. The conditional frequency distribution of the age of husbands when the age of wives lies between 25 – 35. (2)

- v. The regression equation of Y on X is $y = \frac{2}{9}x$ and the regression equation of X on Y is $x = \frac{y}{2} + \frac{7}{6}$

Find: a. Correlation coefficient between X and Y.

b. σ_y^2 if $\sigma_x^2 = 4$. (2)

- vi. Identify the regression equations of X on Y and Y on X from the following equations:
 $2x + 3y = 6$ and $5x + 7y - 12 = 0$ (2)

- vii. If X has Poisson distribution with parameter $m = 1$, find $P[X \leq 1]$. (Use $e^{-1} = 0.3679$) (2)

- viii. Three fair coins are tossed simultaneously. If X denotes the number of heads, find the probability distribution of X. (2)

Q.5. (A) Attempt any TWO of the following: (6)[14]

- i. Ramesh, Vivek and Sunil started a business by investing capitals in the ratio 4 : 5 : 6. After 3 months Vivek withdrew all his capital and after 6 months Sunil withdrew all his capital from the business. At the end of the year Ramesh received ₹ 6,400 as profit. Find the profit earned by Vivek. (3)

- ii. Solve the following minimal assignment problem and hence find the minimum value:

	I	II	III	IV
A	2	10	9	7
B	13	2	12	2
C	3	4	6	1
D	4	15	4	9

(3)

- iii. Calculate e_o° , e_p° , e_f° from the following data:

Age x	0	1	2
l_x	1000	900	700
T_x	—	—	11500

(3)

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

- i. A bill was drawn on 12th April for ₹ 3,500 and was discounted on 4th July at 5% p.a. If the banker paid ₹ 3,465 for the bill, find period of the bill. (4)

- ii. Find Karl Pearson's correlation coefficient for the following data:

X	3	2	1	5	4
Y	8	4	10	2	6

(4)

- iii. Solve the following using graphical method:

Minimize: $Z = 3x + 5y$

Subject to $2x + 3y \geq 12$,

$-x + y \leq 3$

$x \leq 4, y \geq 3, x \geq 0, y \geq 0$ (4)

Q.6. (A) Attempt any TWO of the following:

(6)[14]

- i. Given the following information:

Age groups (in years)	Population	Number of deaths
0 – 20	40,000	350
20 – 65	65,000	650
65 and above	15,000	X

Find X, if the CDR = 13.4 per thousand. (3)

- ii. The manager of a company wants to find a measure which he can use to fix the monthly wages of persons applying job in the production department. As an experimental project, he collected data of 7 persons from the department referring to years of service and their monthly income:

Years of service	11	7	9	5	8	6	10
Income (` in thousands)	10	8	6	5	9	7	11

Find regression equation of income on the years of service. (3)

- iii. Solve the following inequation:

$$-8 < -(3x - 5) < 13 \quad (3)$$

(B) Attempt any TWO of the following:

(8)

- i. Find the probability of guessing correctly at most three of the seven answers in a True or False objective test. (4)

- ii. A person bought a television set paying ` 20,000 in cash and promised to pay ` 1,000 at the end of every month for the next 2 years. If the money is worth 12% p.a. converted monthly, what is the cash price of the television set?

$$[(1.01)^{-24} = 0.7884] \quad (4)$$

- iii. There are four jobs to be completed. Each job must go through machines M_1, M_2, M_3 in the order $M_1 - M_2 - M_3$. Processing time in hours is given below. Determine the optimal sequence and idle time for Machine M_1 .

Jobs	A	B	C	D
M_1	5	8	7	3
M_2	6	7	2	5
M_3	7	8	10	9

(4)