

# 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  $\frac{d}{dx} y$ , 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  $A = \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix}$  (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  $x = \cos \theta$  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  $\frac{d}{dx} y$ , 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]

- i. 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)
- ii. Find the Age-Specific Death Rate (Age-SDR) for the following date:

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)

- iii. 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)
- iv. 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  $y = 9^{\frac{2}{x}}$  and the regression equation of X on Y is  $x = 2^{\frac{y}{7}} + 6$
- Find: a. Correlation coefficient between X and Y.  
 b.  $\sigma_y^2$  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

- iii. Calculate  $e_0^\circ, e_1^\circ, e_2^\circ$  from the following data:

Age $x$	0	1	2
$l_x$	1000	900	700
$T_x$	-	-	11500

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

- i. A bill was drawn on 12<sup>th</sup> April for ₹ 3,500 and was discounted on 4<sup>th</sup> 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

- 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:

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