Ashish Group Tuition

Time: 3 Hrs | Sub: MATHS 1 & 2 | Marks: 80

Note:1) All Question Are Compulsory
2) Figures To The Right Indicate Full Marks
3) Answer To Every Question Must Be Start On A New Page. & LPP solve on graph.

section-I

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

i. Draw Venn diagram for the truth of the following statements:
a. All rational numbers are real numbers.
b. Some rectangles are squares.

ii. Find the inverse of the matrix A = $\begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$ using elementry transformations.

iii. Examine the continuity of

$f(x) = x^2 - x + 9$ for $x \leq 3$

$= 4x + 3$ for $x > 3$, at $x = 3$

iv. Find $\frac{dy}{dx}$, if $y = \cos^{-1}(\sin 5x)$

v. The price P for demand D is given as $P = 183 + 120D - 3D^2$. Find D for which the price is increasing.

vi. Find cofactors of the elements of the matrix A = $\begin{pmatrix} -1 & 2 \\ -3 & 4 \end{pmatrix}$

vii. write negation of the following statements:
a. The number 6 is an even number or the number 25 is a perfect square.
b. If $x \in A \cap B$, then $x \in A$ and $x \in B$

iv. The total revenue $R = 720x - 3x^2$ where x is number of items sold. Find x for which total revenue R is increasing.

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

i. Find k, if $f(x) = \frac{\log(1 + 3x)}{5x}$ for $x \neq 0$

$= k$ for $x = 0$

is continuous at x = 0.

ii. Examine whether the following statement pattern is tautology, contradiction or contingency: $p \vee \sim(p \wedge q)$

iii. Solve the following equations by the inversion method:
$2x + 3y = -5$ and $3x + y = 3$

(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."

ii. 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.

iii. Solve the following equations by reduction method: $x + 2y + z = 8$, $2x + 3y - z = 11$, $3x - y - 2z = 5$

Q.3. (A) Attempt any **TWO** of the following: (6)

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

$= 10$ for $x = 4$, at $x = 4$

ii. Find $\dfrac{dy}{dx}$, if $e^x + e^y = e^{x-y}$

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

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

i. 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

ii. Find the inverse of matrix A by using adjoint method;

where $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$

iii. Without using the truth table, show that

$p \wedge [(\sim p \vee q) \vee \sim q] \equiv p$

section-II

Q.4. Attempt any **SIX** of the following: [12]

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

Age group (in years)	No. of persons (in '000)	No. of Deaths
0-10	11	240
10-20	12	150
20-60	9	125
60 and above	2	90

ii. 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.

iii. 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.

iv. Three fair coins are tossed simultaneously. If X denotes the number of heads, find the probability distribution of X.

v. In a class, 60% students are boys and 40% are girls. By admitting 16 boys and 8 girls, the ratio of boys to girls becomes 8 : 5. Find the original number of boys and girls in the class.

vi. Solve the inequation $-8 \leq 3x - 5 < 7$ and represent it on the real number line.

vii. If the rank correlation coefficient is 0.6 and the sum of squares of differences of ranks is 66, then find the number of pairs of observations.

viii. A, B and C are in partnership. A's capital was Rs 65,000. C's capital was Rs 50,000. The total profit is Rs 38,000, out of which B's profit is Rs. 15,000. What was B's capital ?

Q.5. (A) Attempt any **TWO** of the following: (6)

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.

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

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

ii. Solve the following using graphical method:

Minimize: $Z = 3x + 5y$

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

$-x + y \leq 3$

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

iii. Coefficient of correlation between the variables X and Y is 0.3 and their covariance is 12. The variance of X is 9, find the standard deviation of Y.

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

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.

ii. Solve the following inequation:

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

iii. Fill in the blanks which are marked with a question mark in the following extract from the life table:

x	l_x	d_x	q_x	p_x	L_x	T_x
20	88230	?	?	?	?	?
21	79473					3205552

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

i. The following data gives the marks of 20 students in Mathematics (X) and Statistics (Y), each out of 10, expressed as (X, Y). Construct ungrouped frequency distribution considering single number as a class. Also prepare marginal distributions

(2, 7), (3, 8), (4, 9), (2, 8), (2, 8), (5, 6), (5, 7), (4, 9), (3, 8), (4, 8), (2, 9), (3, 8), (4, 8), (5, 6), (4, 7), (4, 7), (4, 6), (5, 6), (5, 7), (4, 6).

ii. Given the following table which relates to the number of animals of a certain species at age 'x', complete the life table.

x	0	1	2	3	4	5
l_x	1000	850	760	360	25	0

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