Duration: 2 hrs   Max Marks:80

Instructions:

   1) Figures to the right indicate maximum marks.
   2) All Questions are Compulsory however internal choice is available.

Q1.   Answer the following: (5x4=20 Marks)

A) If A = {1, 3, 5}, B = {3, 5, 6} and C = {1, 3, 7}

Verify that A ∪ (B ∩ C) = (A ∪ B) ∩ (A ∪ C)

B) Calvin wants to go to Delhi. He can choose from 4 bus services or 3 train services to head from home to Mumbai. From there, he can choose from 6 bus services or 4 train services to head to Delhi. How many ways are there for him to get to Delhi?

C) Solve $\begin{vmatrix} x & -1 & 1 \\ 1 & x & 1 \\ 1 & 1 & 0 \end{vmatrix} = 0$

D) Find the Arithmetic Mean for the following frequency distribution.

x	10	20	30	40	50	60
frequency	8	16	25	24	18	9

OR

Q1.   Answer the following: (5x4=20 Marks)

V) Find variance for the following data

x	1	2	3	4
frequency	2	2	4	2

W) $5(^nP_4) = 3(^{n+1}P_4)$, Find the value of n.

X) $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 4 \\ 4 & 2 \\ -3 & 1 \end{bmatrix}$. Show that $A \times B \neq B \times A$.

Y) Find the D_6 of the following data

11, 25, 20, 15, 24, 28, 19, 21

Q2.   Answer the following: (5x4=20 Marks)

A) Is the function $f: Z \to Z$, given by $f(x) = 2x + 1$ is one-one and onto?

B) There are 4 boys and 5 girls, out of whom, a committee of 2 boys and 3 girls is to be formed. Find the number of ways this can be done if there is no restriction on the selection

C) Find the Minors and Cofactors of the matrix $\begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix}$.

D) Find mode of the following:

Class intervals	10-20	20-30	30-40	40-50
Frequency	2	5	6	3

Q2. Answer the following: (5x4=20 Marks)

V) Find the solution for the recurrence relation:

$F_n = F_{n-1} + F_{n-2}$, given $F_0 = F_1 = 1$.

W) Find $f \circ g$ and $g \circ f$ for $f(x) = 2x + 3$ and $g(x) = -x^2 + 1$

X) Find the inverse function of (i) $f(x) = \frac{2x-3}{x+2}$, (ii) $f(x) = 2x^2 + 2$

Y) How many ways can 3 books on Accounts, 2 books on Statistics and 1 book each of Communication Skills and Environmental Studies be arranged on a shelf so that the books of same subject are always together?

Q3. Answer the following: (5x4=20 Marks)

A) Two friends Raj and Reena want to start a Travel Agency. So, they spend Rs.11 Lakhs and Rs.16 Lakhs respectively to buy cars and vans. If the number of cars and vans bought by each one is given in the following table, find the cost of the car and the van using Cramer's Rule.

	Car (x Rs.)	Van (y Rs.)
Raj	3	1
Reena	4	2

B) The following is the monthly income (in 1000) of 8 persons working in a factory. Find P_{30} income value 10,15, 37, 26, 14, 21, 29, 17.

C) The ages of employees of a company are tabulated below. Find the median.

Age of employees	20-30	30-40	40-50	50-60
No. of employees	31	45	51	23

D) Find the rank of the matrix $\begin{bmatrix} 5 & 3 & 0 \\ 1 & 2 & -4 \\ -2 & -4 & 8 \end{bmatrix}$

OR

Q3. Answer the following: (5x4=20 Marks)

V) Find Spearman's rank coefficient for the following

R_1	1	2	3	3	5
R_2	4	3	5	1	2

W) If $n(U) = 38, n(A) = 14, n(A \cap B) = 10, n(B') = 22$ find $n(A \cup B)$?

X) Find inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 0 \\ 3 & 0 & 1 \end{bmatrix}$

Y) Find the quartiles of the marks of 9 students given below
29,12,26,19,24,36,21,33,35.

Q4. Answer the following: (5x4=20 Marks)

A) Find variance and standard deviation for the following distribution

Class Intervals	0-2	2-4	4-6	6-8	8-10
Frequency	10	20	30	10	10

B) In an examination there are two groups each containing 8 questions. A candidate is required to attempt 11 questions but not more than 7 questions from any group. In how many ways can 11 questions be selected?

C) For the bivariate data find the coefficients of regression and equations of both lines of regression.

x	2	1	3
y	5	7	3

D) Evaluate the Eigenvalues for the Following Matrix:

$$A = \begin{bmatrix} 4 & 6 \\ 1 & 5 \end{bmatrix}$$

OR

Q4. Answer the following: (5x4=20 Marks)

V) Calculate the range and the coefficient of range for each of the following:

Marks	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	9	15	22	38	17	4

W) Consider that a relation on the set of real numbers $\mathbb{R}$ that are defined by $R = \{(x,y)|x - y \in \mathbb{Z},\ x \in \mathbb{R}, y \in \mathbb{R}\}$. Prove that it is an equivalence relation.

X) Find the quartile deviation of the following data showing marks of 16 students:
18, 3, 7, 26, 15, 5, 16, 8, 10, 24, 45, 9, 8, 6, 19, 29.

Y) Calculate the Mean deviation from the mean of the following data which represent the heights (in cms) of 9 soldiers.
167, 165, 174, 169, 178, 176, 172, 164,165

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