

Total No. of Printed Pages: 03

B. Voc (Software Technologies) Semester-V

EXAMINATION MAY 2023

Advanced Quantitative Techniques

[Time: 2 Hours]

[Max. Marks:80]

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q1 Answer **any four** from the following.

4x4=16

- a) Given two sets $A = \{3, 4, 5, 1, 2, 6\}$ and $B = \{3, 4, 5\}$, find the following
 - i) $A \cup B$
 - ii) $A \cap B$
 - iii) $A \times B$
 - iv) $A - B$
- b) Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the
 - i) ticket drawn has a number which is a multiple of 3 or 5
 - ii) ticket drawn is a prime number
- c) Let $A = \{1, 2\}$ and $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$. Verify whether
 - i) $A \times C$ is a subset of $B \times D$
 - ii) $A \times D$ is a subset of $B \times C$
- d) If 10 boys meet at a reunion and each boy shakes hand exactly once with each of the others, then what is the total number of handshakes? If only 5 boys meet and shakes hands, then what is the total number of handshakes?
- e) In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that
 - i) It is neither red nor green
 - ii) It is either blue or green.
- f) In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French?

Q2 Answer any four from the following.

4x4=16

- a) Given $A = \begin{bmatrix} 3 & 6 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$ Find $A.B$ and $A - B$
- b) Classify the following matrices into diagonal matrix, identity matrix, upper triangular matrix or lower triangular matrix.
- i) $\begin{bmatrix} 1 & 2 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ ii) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ iii) $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 3 & 4 & 3 \end{bmatrix}$ iv) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- c) Solve the following set of linear equations using Cramer's rule.
 $x + 2y = 5$
 $2x + 3y = 10$
- d) For the following raw data, prepare a frequency distribution with the starting class as 5-9 and all classes with the width 5.
 Marks in English = {12, 36, 40, 16, 10, 10, 19, 20, 28, 30, 19, 27, 15, 21, 33, 7, 19, 20, 26, 26, 37, 6, 5, 20, 30, 37, 17, 11, 20}.
- e) Calculate the mean, median and mode from the following data of the heights in inches of a group of students.
 10, 20, 20, 30, 10, 15, 14, 6, 5, 20
- f) If $N = 10$, $\bar{X} = 12$, $\sum X^2 = 1530$, find the coefficient of variation.

Q3 A. Consider the relation R on a set $\{1, 2, 3, 4, 5\}$. $R = \{(1,1), (1,3), (1,5), (2,2), (2,4), (3,1), (3,3), (3,5), (4,2), (4,4), (5,1), (5,3), (5,5)\}$. Check if the relation is reflexive, symmetric, antisymmetric, transitive or equivalence relation. 06

OR

A. Describe the properties of a relation on a set. 06

B. The keys 12, 18, 13, 2, 3, 25 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What is the resultant hash table? 06

Q4 A. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? 06

OR

A. In how many different ways can the letters of the word 'LEADING' be arranged so that the vowels always come together? 06

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- B. Two cards are drawn together at random from a deck of 52 cards. Find the probability of getting 06
- both the cards as kings
 - one king and one queen

- 5 A. Find the rank of following matrix. 06

i) $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$ ii) $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 3 \\ 4 & 6 & 7 \end{bmatrix}$

OR

- A. Find the eigen values and eigen vectors of following matrix. 06

$$A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$$

- B. Find the inverse of following matrix. 06

$$A = \begin{bmatrix} 3 & 7 & 2 \\ 4 & 5 & 1 \\ 1 & 5 & 2 \end{bmatrix}$$

- 16 A. Explain the concept of sampling and types of sampling. 06

OR

- A. From the following table, calculate the coefficient of correlation by Karl Pearson's method. 06

X	6	2	10	4	8
Y	9	11	5	8	7

- B. In the estimation of regression equations of two variables X and Y, 06

The following results were obtained.

$$\sum X = 900, \sum Y = 700, n = 10, \sum x^2 = 1300, \sum y^2 = 2600, \sum xy = 3900$$

where x and y are deviations from respective means. Obtain the two regression equations.