Shri S. H. Kelkar College of Arts, Commerce and Science, Devgad

S.Y.BSC SEMESTER-III Examination- October 2023

Course: Mathematics Paper-II | **Course Code: USMT302**

Maximum marks: 75 | **Duration: 2 ½Hrs**

Instructions:

All questions are compulsory and carry equal marks

Use of scientific calculator is allowed

Figures to the right indicate full marks

Q.1 Attempt any four of the following **20**

a) Explain system of linear equations

b) Define the following term 1) row echelon form of matrix 2) inverse of matrix

c) Show that the system of equation $5x + 2y + 3z = 0,\ 8x - 7y + z = 0, 3x - 9y + 2z = 0$ have non-trivial solution

d) Find the solution of system 1) $2x - y = 0$, 2) $2x + y = 0, x + y = 0$

e) Using Gaussian elimination method find the solution of $\begin{bmatrix} 2 & 2 & 1 \\ 0 & -3 & 4 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \\ 2 \end{bmatrix}$

Q.2 Attempt any four of the following **20**

a) Explain the vector space over R

b) Define linear combination of set of vector and express the vector (2, 3) as linear combination of $V_1 = (1, 0), V_2 = (1, 1)$

c) Check whether the set $S = \{(x, 1, z) \mid x, z \in R\}$ is subspace or not

d) Show that for the set of vector space $P_2[x]$, the set $T = \{1, x, x^2\}$ is linearly independent

e) Prove that the set $S = \{(1, 0), (0, 1)\}$ is basis of vector space R^2 over R

Q.3 Attempt any four of the following **20**

a) Explain Determinant function

b) Find all permutations of {1, 2, 3} and also states they are even or odd

c) Expand determinant of matrix $A = \begin{bmatrix} 3 & 2 & 5 \\ 0 & 3 & 2 \\ 2 & 1 & 1 \end{bmatrix}$ using Laplace expansion by 2nd row and 3rd column

d) Using Cramers rule solve $x + y - z = 1; 8x + 3y - 6z = 1; -4x - y + 3z = 1$

e) Prove that for each n, if there exist an n x n determinant function then it is unique.

Q.4 Attempt any three of the following **15**

a) Find k if the system of equations $kx + 2y + 3z = 0; 2x - 3y + z = 0; 3x - y + 4z = 0$ have non-trivial solution

b) Find the inverse of $\begin{bmatrix} 5 & 4 \\ 3 & 2 \end{bmatrix}$

c) Prove that ' V is vector space over R and W_1 *and* W_2 are subspace of V then $W_1 + W_2$ is subspace of V

d) Examine the consistency of linear equation $2x - y + z = 8; 3x - y + z = 6; 4x - y + 2z = 7;\ -x + y - z = 4$