Parvatibai Chowgule College of Arts & Science
Autonomous

B.Sc. Semester End Examination, January 2022

Semester: III

Subject: Computer Science

Title: Mathematical Foundation of Computer Science-II (Elective)

Duration: 2 Hours Max.Marks: 45

Instructions: Figure to the right indicate marks

Q. 1. Answer ANY THREE of the following: (9)

a. State the condition for the system of equations AX=B to be consistent and has unique solution.

b. When subjected to heat, aluminium reacts with copper oxide to produce copper metal and aluminium oxide according to the equation $Al_3 + CuO \rightarrow Al_2O_3 + Cu$. Generate the system of linear equations.

c. Obtain the eigenvalues of matrix

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

d. Let and

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

Determine if W is in col space of A.

Q. 2. Answer ANY TWO of the following: (12)

a. Apply elementary row operations to transform the following matrix first into echelon form and then into row reduced echelon form.

$$\begin{bmatrix} 0 & 3 & -6 & 6 & 4 & -5 \\ 3 & -7 & 8 & -5 & 8 & 9 \\ 3 & -9 & 12 & -9 & 6 & 15 \end{bmatrix}$$

b. Solve the linear system using Gauss Elimination Method.

$x + y + z = 4$, $-x - y + z = -2$, $2x - y + 2z = 2$

c. Given v1 and v2 in vector space V. Let H =span {v1,v2}. Show that H is a subspace of V.

P.T.O

Q. 3. Answer <u>ANY TWO</u> of the following: (12)

a. Apply Lagrange formula to find f(5), given that f(1)=2, f(2)=4,f(3)=8,f(4)=16, f(7)=128 and explain why result differs from 2^5

b. Given the following matrices

$$A = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix} \quad M1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad M2 = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \quad M3 = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

Show that the Matrix "A" is a linear combination of M1,M2 and M3.

c. Derive and solve.

1) Derive Trapezoidal Rule.
2) A river is 100m wide and depth of water at different distances from one bank is given in the table.If water flows at 50m per minute, find the quantity of water flowing per hour in the river.

S	0	10	20	30	40	50	60	70	80	90
$Depth$	2	6	10	12	15	10	8	6	3	0

Q. 4. Answer <u>ANY ONE</u> of the following: (12)

a. Prove the following

1) Any three eigenvectors of distinct eigenvalues are linearly independent.
2) State and prove Diagonalization Theorem with the help of an example.

OR

b. Geometrically compare the Bisection method with the False position method and list their merits and demerits.

****