

**VIT**Vellore Institute of Technology  
Established in the year 1984 by the Vellore Institute of Technology Society, a Trust registered under the Indian Companies Act, 1956.DEPARTMENT OF MATHEMATICS  
SCHOOL OF ADVANCED SCIENCES

Winter Semester - 2019 ~ 2020

Course Code : MAT3004

Course Name : Applied Linear Algebra

Duration : 90 Minutes

Slot: A2+TA2

Date: 19.01.2020

Max. Marks: 50

Continuous Assessment Test - I, Jan - 2020

**ANSWER ALL**

Q1. For what values of  $a$  and  $b$  the following system [10]

$$x + 2y + 3z = 6;$$

$$x + 3y + 5z = 9;$$

$$2x + 5y + az = b.$$

has (i) no solution (ii) Unique solution (iii) Infinite number of solutions.

Q2. Solve the system of equations by using LU decomposition method

$$x + 2y - z = -3;$$

$$y - z = 1;$$

$$3x - y + z = 4.$$

[10]

Q3. Express the given matrix as a product of elementary matrices

$$\begin{bmatrix} 7 & 2 & 1 \\ 0 & 3 & -1 \\ -3 & 4 & -2 \end{bmatrix}.$$

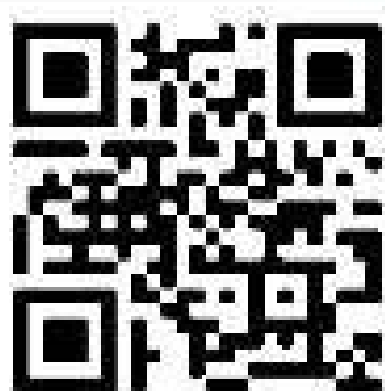
[10]

Q4. (a) Let  $x_1, x_2, \dots, x_n$  be vectors in a vector space  $V$ . Then the set  $W = \{a_1x_1 + a_2x_2 + \dots + a_nx_n : a_i \in R\}$  of all linear combinations of  $x_1, x_2, \dots, x_n$  is a subspace of  $V$ . [5]

(b) Express the polynomial  $v = t^2 + 4t - 3$  in  $P(t)$  as a linear combination of the polynomials  $P_1 = t^2 - 2t + 5$ ,  $P_2 = 2t^2 - 3t$  and  $P_3 = t + 1$ . [5]

Q5. (a) Consider the polynomials  $p(x) = 1 + 3x + 2x^2$ ,  $q(x) = 3 + x + 2x^2$ ,  $r(x) = 2x + x^2$  in  $\mathcal{P}_2$ . Where  $\mathcal{P}_2$  is collection of all polynomials of degree less than or equal to 2. Is  $\{p(x), q(x), r(x)\}$  linearly independent? [5]

(b) Write a basis for the following vector spaces (i)  $3 \times 3$  symmetric matrices with real entries over  $R$  (ii)  $3 \times 3$  matrices with sum of all main diagonal entries are zero over  $R$ . [5]



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