COEP Technological University

(COEP Tech)
A Unitary Public University of Government of Maharashtra
w.e.f 21st June 2022
(Formerly College of Engineering Pune)

(MA-19002) Linear Algebra

Program : F.Y.B.Tech. Sem. I (All Branches)
Examination : T-1
Date: 16/12/2022

Academic Year : 2022-23
Maximum Marks : 20
Time: 4.30pm-5.30pm

Student MIS Number : | 6 | 1 | 2 | 2 | 0 | 3 | 0 | 1 | 2 |

Instructions :

1. Write your MIS Number on Question Paper.
2. Rough work/Calculations/marking anything on question paper is not allowed.
3. Mobile phones and programmable calculators are strictly prohibited.
4. Figures to the right indicate the course outcomes and maximum marks.

Attempt the following questions.

Question [I](5 marks)

1. Let A be a matrix of order 3, such that $|A| = -2$. Then find $|2A|$. [CO1][1]
2. Draw graph of equations in the system $-3x - y = 3,\ 6x + 2y = 1$. Determine whether the system is consistent or inconsistent by examining graph and write solution of the system, if exists. [CO2][2]
3. Show that a square matrix can be written as sum of a symmetric matrix and a skew-symmetric matrix. [CO3][2]

Question [II](5 marks)

1. Solve the following system of linear equations:

$$x_1 - x_2 + x_3 = 0;\ 10x_2 + 25x_3 = 80;\ 20x_1 + 10x_2 = 80;\ 2x_1 + 3x_2 + 5x_3 = 26.$$

Show details of your work. [CO3][3]

P. T. O.

2. Suppose that as per a weight watching program, 300 cal/hr are burnt in walking (W), 400 cal/hr are burnt in cycling (C) and 900 cal/hr are burnt in jogging (J). A person weighing 180 lb, plans to exercise according to the following matrix.

$$\begin{array}{c} \\ \text{Mon} \\ \text{Wed} \\ \text{Fri} \\ \text{Sat} \end{array} \begin{array}{c} \begin{array}{ccc} \text{W} & \text{C} & \text{J} \end{array} \\ \begin{bmatrix} 1.0 & 0.0 & 0.5 \\ 1.0 & 0.75 & 0.0 \\ 1.0 & 0.0 & 0.5 \\ 1.5 & 1.0 & 0.5 \end{bmatrix} \end{array}$$

How many calories are burnt on each specified day? [CO5][2]

Question [III](5 marks)

1. If three lines in a plane are sides of a triangle, then the system of equations formed from their equations has three solutions, one corresponding to each vertex. [CO1][1]

2. Determine whether $\mathbb{R}^2$ with operations $(x_1, y_1) + (x_2, y_2) = (x_1 - x_2, y_1 - y_2)$ and $c(x, y) = (x^c, y)$ is a vector space. If not, identify at least one of the ten vector space axioms that fail to hold. [CO2][2]

3. If V and W are both subspaces of vector space U. Then prove that the intersection of V and W denoted by $V \cap W$ is also a subspace of U. [CO4][2]

Question [IV](5 marks)

1. Can we write the matrix $\begin{bmatrix} 6 & -19 \\ 10 & 7 \end{bmatrix}$ as the linear combination of following matrices? If yes, write the linear combination and if no justify why? [CO2][2]

$$\left\{ \begin{bmatrix} 2 & -3 \\ 4 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 5 \\ 1 & -2 \end{bmatrix} \right\}$$

2. Write the spanning set for the vector space of 2×2 symmetric matrices with respect to usual matrix addition and scalar multiplication. [CO3][1]

3. State whether the given statement is true or false and justify your answer. "In a vector space V, a subset of a spanning set of V is spanning set of V." [CO3] [2]

False, take std.set

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