POSSESSION OF MOBILES IN EXAM IS UFM PRACTICE

Name of Student:———————— Enrollment Number: ————————

BENNETT UNIVERSITY, GREATER NOIDA
B.TECH., MINOR-1 EXAMINATION
SPRING SEMESTER 2017-18

COURSE CODE :	EMAT102L	MAX. TIME: 1 Hour
COURSE NAME :	Linear Algebra and Ordinary Differential Equations	
COURSE CREDIT:	3-1-0-4	MAX. MARKS: 15

Instructions
There are **five** questions in this question paper, and all questions are mandatory. Rough work must be carried out at the back of the answer script.

1. Is the matrix

$$A = \begin{bmatrix} 0 & 2 \\ 0 & 0 \\ 1 & 0 \end{bmatrix}$$

in reduced row echelon form? If not, find its reduced row echelon form. Also, find the rank of the matrix A. [2]

2. For what values of $k \in \mathbb{R}$, the following systems of equations has (i) no solution, (ii) a unique solution, and (iii) infinitely many solutions? [3]

$$x + 2y - z = 1, \qquad 2x + 3y + kz = 3, \qquad x + ky + 3z = 2.$$

3. Do any one of the following: [3]

Let the set $X = \{A \in \mathcal{M}_{n\times n}(\mathbb{R}) \ : \ A^T = -A\}$ be a subspace of $\mathcal{M}_{n\times n}(\mathbb{R})$. Find a basis of X and its dimension.

or

Prove that the set $Y = \left\{ \begin{bmatrix} x_1 & x_2 & x_3 & x_4 & x_5 \end{bmatrix}^t \in \mathbb{R}^5 \ : \ x_i = 0 \text{ when } i \text{ is odd} \right\}$ is a subspace of $\mathbb{R}^5$. Find a basis of Y and its dimension.

4. Prove or disprove:

(a) The set $U = \left\{ \begin{bmatrix} m & n \end{bmatrix}^t \ : \ m \text{ and } n \text{ are integers} \right\}$ is a subspace of $\mathbb{R}^2$. [1]

(b) The set $W = \left\{ \begin{bmatrix} x & 0 & 0 \end{bmatrix}^t \ : \ x \in \mathbb{R} \right\} \bigcup \left\{ \begin{bmatrix} 0 & y & 0 \end{bmatrix}^t \ : \ y \in \mathbb{R} \right\}$ is a subspace of $\mathbb{R}^3$. [1]

P. T. O.

(c) The set $Z = \left\{ \begin{bmatrix} x & y & z \end{bmatrix}^t \in \mathbb{R}^3 \ : \ x + 2y + 3z = 4 \right\}$ is a subspace of $\mathbb{R}^3$. [1]

(d) The map $T : \mathbb{C} \to \mathbb{C}$ defined by

$$T(x + \iota y) = x$$

is a linear transformation, where $\mathbb{C}$ (set of all complex numbers) is a vector space over $\mathbb{C}$. [1]

5. Prove that if $\{v_1, v_2, \ldots, v_n\}$ is linearly independent in a vector space V, then so is the set $\{v_1 - v_2, v_2 - v_3, \ldots, v_{n-1} - v_n, v_n\}$ obtained by subtracting from each vector (except the last one) the following vector. [3]