EAST WEST UNIVERSITY

Mid-I Examination, Fall-2021
Department of Mathematics and Physical Sciences
Course Code: MAT 205 (Linear Algebra and Complex Variables)
Section: 7,   Time: 90 minutes,   Full Marks: 40
Course Instructor: Dr. Nepal Chandra Roy (DNCR)

N.B.: Answer all the questions. Figure in the right margin indicate full marks.

1. Determine the values of k such that the system in unknowns x, y and z has (i) a unique solution, (ii) no solution, (iii) more than one solution: [10]

$$kx + y + z = 1$$
$$x + ky + z = 1$$
$$x + y + kz = 1$$

2. (a) Find the inverse of the matrix [5]

$$A = \begin{bmatrix} 1 & 3 & -4 \\ 0 & -4 & 2 \\ 1 & -1 & 5 \end{bmatrix}$$

(b) Consider the vectors $u_1 = (1,-1,3), u_2 = (3,2,5), u_3 = (2,1,4)$ in R^3. Show that V=(−1, 2, 3) is a linear combination of u_1, u_2 and u_3. [5]

3. (a) Test the dependency of the sets $\{(1,2,-3),(2,0,-1),(7,6,-11)\}$. [5]

(b) Find the Hermitian matrix of [5]

$$A = \begin{bmatrix} 2-5i & 1-i & 4+5i \\ 1-4i & -4 & 3+2i \\ 3i & 1-8i & 2+3i \end{bmatrix}$$

4. (a) Show that $T = \{(x, y, z, t) \in R^4 : x - y + 2z - 3t = 0\}$ is a subspace of R^4. [5]

(b) Let S and T be the following subspaces of R^4: [5]

$$S = \{(x, y, z, t) \in R^4 : x - 3y + t = 0\}$$

$$T = \{(x, y, z, t) \in R^4 : x - 3y = 0, z - t = 0\}.$$

Find a basis and dimension of T and $S \cap T$.