King Fahd University of Petroleum and Minerals

Department of Mathematics & Statistics

Math - 202 Semester - 062 Quiz # V

Name: **S. No.:** **ID:**

Maximum Marks: 10 Section: Time Allowed: 20 Minutes

NOTE: *Give the solution of any TWO questions.*

1. Verify that (5 Marks)

$$X_1 = \begin{bmatrix} \cos t \\ -\frac{1}{2}\cos t + \frac{1}{2}\sin t \\ -\cos t - \sin t \end{bmatrix}, \quad X_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \quad X_3 = \begin{bmatrix} \sin t \\ -\frac{1}{2}\sin t - \frac{1}{2}\cos t \\ -\sin t + \cos t \end{bmatrix}$$

   form a fundamental set of solutions of the system $X' = AX$ and write down the general solution of the system.

2. Let $X' = AX$ be a homogeneous system, where (5 Marks)

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

   is a matrix whose one of the eigenvalues is $\lambda = 5$. Corresponding this eigenvalue, find a linearly independent solution of the given system.

3. Let $X' = AX$ be a homogeneous system, where $A = \begin{bmatrix} 6 & -1 \\ 5 & 4 \end{bmatrix}$ is a 2×2 matrix. Find the eigenvalues and eigenvectors of A. (5 Marks)

Solution.