KFUPM – Math 202– Major Quiz 6

Name : ..... **ID** #.....Sec# ..... Serial #: .....

Question 1: Find the eigenvalues of the matrix

$$A = \begin{pmatrix} 4 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}.$$

Question 2: Use eigenvalues and eigenvectors to find the general solution of the system

$$X'(t) = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} X(t).$$

Question 3: Solve the initial value problem:

$$X'(t) = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} X(t), \quad X(0) = \begin{pmatrix} x_0 \\ y_0 \end{pmatrix}$$

Question 4: Use matrix exponential to find a fundamental matrix of the system

$$X'(t) = \begin{pmatrix} 3 & 0 \\ 0 & 5 \end{pmatrix} X(t).$$

Question 5: Let A be a 2×2 matrix. If $\lambda = 2 + 3i$ is an eigenvalue with a corresponding eigenvector $K = \begin{pmatrix} 1 - i \\ 2 \end{pmatrix}$, then find the general solution of the system $X' = AX$.