Kingdom of Saudi Arabia
Ministry of Higher Education
Al-Imam Mohammad Ibn Saud
Islamic University
- College of Science -
Semester/Year : sem. 2/ 35-36
Duration : 2 Hours

المملكة العربية السعودية
وزارة التعليم العـــالي
جامعة الإمام محمد بن سعود الإسلامية
-كليـــة العـــلوم-
Course name : Linear Algebra & Diff Eqs
Course code : Math 227

Final Examination

Question 1 . (6 Marks)

Solve the following system of linear equations using Gauss-Jordan elimination :

$$\begin{cases} x_1 - 2x_2 + 5x_3 - 5x_4 = -7 \\ 3x_1 + x_2 + x_3 + 6x_4 = 14 \\ 4x_1 + x_2 + 2x_3 + 7x_4 = 17 \end{cases}$$

Question 2 . (6 Marks)

Find the inverse of the matrix : $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 7 \\ -1 & 1 & -4 \end{bmatrix}$.

Question 3 . (4+2=6 marks)

(3.a) Determine whether the vectors $(1,-2,5)$, $(3,1,1)$ and $(4,1,2)$ form a basis for $\mathbb{R}^3$.

(3.b) Determine whether the subset $W = \{(2a, 2+a) \mid a \in \mathbb{R}\}$ of $\mathbb{R}^2$ is a subspace of $\mathbb{R}^2$.

Question 4 . (3+3=6 marks)

Consider the matrix : $B = \begin{bmatrix} 1 & 2 & 0 \\ 4 & 3 & 0 \\ 5 & 5 & 5 \end{bmatrix}$.

(4.a) Determine all eigenvalues of B.

(4.b) Determine all eigenvectors B corresponding to the eigenvalue $\lambda = -1$.

Question 5 (4 marks for each part)

Solve the the following differential equations :

(5.a) $\dfrac{dy}{dx} = \dfrac{1}{y}$ with $y(0) = 1$. (initial value).

(5.b) $y' + \dfrac{1}{x}\, y = 1$.

(5.c) $y'' - 5y' + 6y = 0$.

(5.d) $y'' - 5y' + 6y = 6x + 1$. (Hint : Use (5.c)).

GOOD LUCK