Mid-West University

Examinations Management Office

Birendranagar, Surkhet

End Semester (Alternative/Physical) Examinations -2078

Bachelor level/ B.Sc. CSIT / 2nd Semester | Full Marks : 60
Time: 3 hrs | Pass Marks : 30
Subject : Basic Mathematics II (MATH 425)

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the Questions **[6x10 = 60]**

1. a) Give an example of REF and RREF. Prove that the following system is consistent: $x_2 - 4x_3 = 8$ and $2x_1 - 3x_2 + 2x_3 = 1$ and $5x_1 - 8x_2 + 7x_3 = 1$.

   b) Define power matrix . Let A = $\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, $find\ A^3$. Find the inverse matrix of $\begin{bmatrix} 3 & 1 & \cdot & 1 & 2 \\ 5 & 2 & \cdot & 2 & 3 \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & \cdot & 5 & 1 \\ 0 & 0 & \cdot & 8 & 2 \end{bmatrix}$

2. Prove that every vector has unique additive inverse.) Find the general solution of the system whose augmented matrix is :

$$\begin{bmatrix} 3 & -4 & 2 & 0 \\ -9 & 12 & -6 & 0 \\ -6 & 8 & -4 & 0 \end{bmatrix}.$$

3. Define Null space . If X = $\begin{bmatrix} -2 \\ 1 \end{bmatrix}$ and A = $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$, Is X $\in NulA$. Find the LU factorization of A = $\begin{bmatrix} 3 & -7 & -2 & 2 \\ -3 & 5 & 1 & 0 \\ 6 & -4 & 0 & -5 \\ -9 & 5 & -5 & 12 \end{bmatrix}$ Use this LU factorization of A to solve AX = b where $b = \begin{bmatrix} -9 \\ 5 \\ 7 \\ 11 \end{bmatrix}$.

OR

Find the angle between two vectors $\boldsymbol{u} = (\mathbf{3}, \mathbf{4})$ ***and*** $\boldsymbol{v} = (-\mathbf{8}, \mathbf{6})$**.** Find the basis for ColA and NulA ,$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

4. Define linear transformation . Let $T: P_2 \rightarrow R^2$ by $T(p) = \begin{bmatrix} p(0) \\ p(1) \end{bmatrix}$. Show that T is linear. The set $B = \{1 + t^2, t + t^2, 1 + 2t + t^2\}$ is basis for P_2. Find the coordinate vector of $p(t) = 1 + 4t + 7t^2$ relative to B.

5. Find the characteristics equation of A = $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 2 & 5 \\ 0 & 0 & -1 \end{bmatrix}$. Let $A = \begin{bmatrix} 1 & 6 \\ 5 & 2 \end{bmatrix}$. show that 7 is an eigenvalue of A also find the corresponding eigenvector.

OR

Define orthogonal vector . Two vectors **u** and **v** are orthogonal then prove $\|\boldsymbol{u}+\boldsymbol{v}\|^2 = \|\boldsymbol{u}\|^2 + \|\boldsymbol{v}\|^2$**.** Use the Gram-Schmidit process to produce an orthogonal basis for W where $\left\{\begin{bmatrix}0\\4\\2\end{bmatrix}, \begin{bmatrix}5\\6\\-7\end{bmatrix}\right\}$ is a basis of subspace W of $\boldsymbol{R}^3$

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6. For what value of h in y in the plane spanned by v_1 *and* v_2? Where $v_1 = \begin{bmatrix}1\\0\\-2\end{bmatrix}, v_2 = \begin{bmatrix}-3\\1\\8\end{bmatrix}$ *and* $y = \begin{bmatrix}h\\-5\\-3\end{bmatrix}$. Show that $S = \{(x_1, x_2, x_3) \in R^3 : x_1 + 2x_2 = 0\}$ is a subspace of R^3.

THE END