B H GARDI COLLEGE OF ENGINEERING & TECHNOLOGY

GTU MID SEM TEST

Subject: MATHEMATICS	**Date: 23/03/2009**
Total Marks: 40	**Sem/Branch: 2nd /EC/CE/IT/ME**
Student Id No._____	**Time: 08:30 to 10:15**

Instructions:
(1) Digits to the right indicate full marks.
(2) Assume suitable data whenever necessary.
(3) Start new question from new page.

Q1: (a) Show whether all the vectors of the form (a, b, c), where $b = a + c$ is subspace of R^3. 2

(b) Show whether the given vector $(2, 2, 2)$ is linear combination of $u = (0, -2, -2)$ and $v = (1, 3, -1)$. 2

(c)Check given matrix is in row-echelon form or reduce row-echelon and **why**?

$$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$ 1

(d) If A is invertible symmetric matrix then prove A^{-1} is also symmetric. 1

(e) Prove that every square matrix can be expressed as a sum of symmetric matrix and skew- symmetric matrix. 2

Q2: a) Find the solution of equations using Cramer's Rule. 4

$x + 2z = 6$

$-3x + 4y + 6z = 30$

$-x - 2y + 3z = 8$

OR

a) Using Adjoint , Find A^{-1}, where $A = \begin{pmatrix} 1 & 3 & 2 \\ 0 & -1 & 4 \\ -2 & 1 & 5 \end{pmatrix}$ 4

b) Find Rank of Matrix in terms of determinant. $\begin{pmatrix} 2 & -1 & 3 \\ 4 & -2 & 6 \\ -6 & 3 & -9 \end{pmatrix}$ 4

Q3: a) Suppose that the set V is the set of positive real numbers with addition and scalar multiplication defined as follows:

$x+y = xy$ and $kx = x^k$. Prove that V is vector space. 6

b) Show that R^2 with given operations fail to be a vector space by identifying all the properties that failed to hold.

$(a, b)+(c, d) = (a+c, b+d)$ and $k(a, b) = (ka, 0)$. 2

OR

b) Determine that the given matrix is linearly independent or not

$(1-t-t^3, -2+3t+t^2+2t^3, 1+t^2+5t^3)$.

Q4: a) Find inverse of given matrix by using Gauss-Jordan method. $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}$ 6

OR

a) Solve system of linear equation by using Gauss-Elimination method. 6

$-2x + y - z = 4$

$x + 2y + 3z = 13$

$3x + z = -1$

b) Check given system is consistent or inconsistent **why**? 2

$x + y + z = 100$

$-x + z = 786$

$x - 5y + 3z = 420$

Q5: a) Find Eigenvalues and Eigenvectors of the following matrix: $\begin{pmatrix} 5 & 3 \\ 1 & 3 \end{pmatrix}$ 5

OR

a) Find Eigenvalues of A^{-1} where $A = \begin{pmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{pmatrix}$ 5

b)Find Eigenvalues of A^T where $A = \begin{pmatrix} -1 & 1 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$ 2

c) Find Eigenvalues of A^{-1} where $A = \begin{pmatrix} -420 & 1/2 & 576 \\ 0 & 0 & 0.6 \\ 0 & 0 & \sqrt{3} \end{pmatrix}$ 1