



Central University of Haryana
Sessional-II

B. Tech. (CSE)

Course Code: BT MAT 111B
Course Title: Mathematics-I

Max Time: 1 Hour
Max Marks: 20

Instructions:

Question Numbers 1(two) to 5(five) carry five marks each with one choice.

Q1. Reduce the matrix A to the row-reduced echelon form and hence find its rank.

$$A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$$

Q2. Use Gram-Schmidt process to obtain an orthonormal basis of the subspace of the Euclidean space \mathbb{R}^4 with standard inner product space generated by the vectors $\{(1,1,0,1), (1,-2,0,0), (1,0,-1,2)\}$.

Q3. For a linear map $f: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ define by $f(x_1, x_2, x_3) = (x_1 + x_2 - x_3, x_2 + x_3, x_1 - x_2 + 5x_3)$, $(x_1, x_2, x_3) \in \mathbb{R}^3$. Find the matrix of f relative to the ordered bases $(0,1,1)$, $(1,0,1)$, $(1,1,0)$ of \mathbb{R}^3 .

Q4. Show that the set $S = \{(1,2,1), (2,1,0), (1,-1,2)\}$ is a basis of \mathbb{R}^3 .

Q5. For a linear map $f: \mathbb{R}^3 \rightarrow \mathbb{R}^4$ define by

$$f(x_1, x_2, x_3) = (x_2 + x_3, x_1 + x_3, x_1 + x_2, x_1 + x_2 + x_3), (x_1, x_2, x_3) \in \mathbb{R}^3.$$

Show that f is a linear mapping. Find $\text{Ker}(f)$, $\text{Im}(f)$, $\text{rank}(f)$ & $\text{nullity}(f)$.