Question Bank For PG Course

Mathematics

Paper-1B

LINEAR ALGEBRA : PGMT-IB

Question 1

Which of the followings is/are vector space over the real field?

1. $Set\ of\ all\ real\ polynomials\ R[x]$
2. $Set\ of\ real\ polynomials\ of\ degree\ 2$
3. $Set\ of\ real\ polynomials\ of\ degree\ less\ than\ 2$

Question 2

Which of the followings is a subspace of the vector space R^2 over the real field?

1. $\{(x,0): x \in R\}$
2. $\{(x,2x): x \in R\}$
3. $\{(x,x^2): x \in R\}$

Question 3

Let $W_1 = \{(x,0): x \in R\}$ and $W_2 = \{(0,y): y \in R\}$. Is $W_1 \cup W_2\ a\ subspace$ Of R^2?

Question 4

Is the vector $(1,2,3)$ linearly independent or dependent in the vector space R^3 over the real field?

Question 5

Are the vectors $(1,2,3), (1,4,0), (0,0,5)\ and\ (1,5,0)$linearly independent or dependent in the vector space R^3 over the real field?

Question 6

What is the standard basis of the vector space $R_2[x], set\ of\ all\ real\ polynomials$ of degree less than or equal to 2 , over the real field?

Question 7

What is the value of the inner product $(x, 0)\ \forall x \in V$ in an inner product space V?

Question 8

Let $T: R^3 \to R^3$ be a linear transformation defined by $T(x, y, z) = (x, y, 0), \forall (x, y, z) \in R^3$. Find the kernel of T.

Question 9

Let $T: V \to W$ be a one-one linear transformation. Find the kernel of T.

Question 10

If a vector space V is isomorphic to the vector space R^3 over the real field, then what is the dimension of V?

Question 11

Is λ is an eigenvalue of a non-singular matrix A, then what is the eigen value of the matrix A^{-1}?

Question 12

Let $T: R^3 \to R^2$ be a linear transformation defined by $T(x, y, z) = (3x + 2y - 4z, x - 5y + 3z)$. Find the matrix of T relative to the basis $(1,1,1), (1,1,0), (1,0,0)\ of\ R^3\ \ and$ $(1,3), (2,5)\ \ of\ \ R^2$.

Question 13

Find the eigen values of the matrix $A = \begin{pmatrix} 1 & 3 \\ 4 & 5 \end{pmatrix}$.

Question 14

What are the eigen values of a real symmetric matrix?

Question 15

Let $A = \begin{pmatrix} 1 & 3 \\ 4 & 5 \end{pmatrix}$ and B is the diagonal matrix with eigen values of A as diagonal elements. If $B = P^{-1}AP$, then find P.

Question 16

Does the set of all real numbers form a vector space over the field of complex numbers?

Question 17

Is there any nontrivial subspace of the vector space of differentiable functions on $[0,1]$ over R other than the subspace of infinitely differentiable functions on $[0,1]$?

Question 18

Let $W_n = \{(x, nx): x \in R\}$ for $n = 1,2,3,4$. Does the set

$$W_1 \cap \ldots \cap W_4$$

form a subspace of R^2?

Question 19

Is the vector $(1,2,\ldots,50)$ linearly independent or dependent in the vector space R^{50} over the real field?

Question 20

Does the set of vectors

$B = \{(0,0,01), (0,1,1,1), (1,0,0,1)\}$

form a basis for the vector space R^4 over the real field?

Question 21

Let W be a nontrivial subspace of a finite dimensional vector space V. Can we extend a basis of W to a basis of V?

Question 22

What is the relation between the inner products$(x,0)$ and $(0,x)$ $\forall x \in V$ in an inner product space V?

Question 23

Let $T: R^3 \to R^5$ be a linear transformation defined by $T(x, y, z) = (0,0,0,0,0), \forall (x, y, z) \in R^3$. Find the dimension of the kernel of T.

Question 24

Let $T: R^2 \rightarrow W$ be a one-one linear transformation. Is the set $\{T(2,1), T(0,1)\}$ linearly independent or dependent in W?

Question 25

Find the rank of the linear transformation $T: R^3 \rightarrow R^2$ defined by $T(x, y, z) = (3x + 2y - 4z, x - 5y + 3z)$

Question 26

Let $v\ and\ w$ be two eigen vectors of the eigen values $\alpha\ and\ \beta$ respectively of the matrix A. Are $v\ and\ w$ linearly independent or dependent when $\alpha \neq \beta$?

Question 27

Let $T: R^2 \rightarrow R^3$ be a linear transformation defined by $T(x, y) = (x + 3y, 2x + 5y, 7x + 9y)$. Find the matrix of T relative to the standard basis $of\ R^2\ and\ R^3$.

Question 28

Is the matrix $\begin{pmatrix} 1 & 4 \\ 2 & 5 \end{pmatrix}$ congruent to the matrix $\begin{pmatrix} 1 & 2 \\ 0 & -3 \end{pmatrix}$?

Question 29

What is the modulus of each eigen value of a real orthogonal matrix?

Question 30

What is the dimensional of the vector space of all real polynomials with degree less than or equal to n?