Mid-West University

Examinations Management Office

Surkhet, Nepal

End Semester Examination-2080

Level: B.Ed./ II Semester FM: 60

Time: 3.00 hrs. PM: 30

Sub: Matrix Algebra (MATH 424/325)

Candidates are required to give their answers in their own words as far as practicable.

Attempt all the questions.

Group "B" **6×5 = 30**

1. Define trace matrix with an example.
   If $A = \begin{pmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{pmatrix}$ Verify that, $AA^T = I = A^T A$.

2. Prove that:
$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$

3. Define nilpotent matrix. If A is a skew-symmetric matrix of odd order, then $|A| = 0$.

Or

Verify that the inverse of a transpose of matrix is the inverse for the matrix. If $A = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$

4. Reduce the matrix $A = \begin{bmatrix} 0 & 1 & -3 \\ 2 & 1 & 4 \\ 1 & 2 & 1 \end{bmatrix}$ to echelon form and find rank of A.

5. Let V be a vector space over a field F and Let U and W be its subspaces. If U+W=V and $U \cap W = \{0\}$, then V is the direct sum of U and W.

6. [illegible] space in terms of its basis.

[illegible]mation. The product of a scalar and a [illegible]nsformation.

Or

Define linear functional with an example. The composition of two linear transformations is linear.

Group "C" **2×10=20**

7. State and prove Cayley-Hamilton theorem.

8. Let V and W be vector space over a field F and assume that dimV=dimW. If T:V⟶W is a linear transformation, then the following statement are equivalent.
   (I) T is a invertible.
   (II) T is one-one and onto and,
   (III) T is non-singular

Or

Define orthogonal vectors with example. The application of Gram-Schmidt process of Orthogonalization to $V_1 = (1,2,2)$, $V_2 = (-1,0,2)$, $V_3 = (0,0,1)$ yealds.

THE END

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Roll No. .....

Group "A" **10 × 1 = 10**

Tick (✓) the best answer.

1. Which one of the followings is a not property of conjugate matrices?

   (a) $\overline{AB} = \bar{A}\bar{B}$ (b) $(A+B)^{\theta} = A^{\theta} + B^{\theta}$

   (c) $\overline{(A+B)} = \overline{A+B}$ (d) $(AB)^{\theta} = B^{\theta}A^{\theta}$

2. If A is a unit matrix, then its determinant is...

   (a) Unity (b) Trace (c) Hermitian (d) Congugate

3. A square matrix A is said to be.....if $A^2 = A$.

   (a) Nilpotent matrix (b) Idempotent matrix

   (c) Involuntery matrix (d) Symmetric matrix

4. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 6 & 8 \end{bmatrix}$ Rank of A = ?

   (a) 0 (b) 1 (c) 2 (d) 3

5. The rank of a matrix the following condition is not satisfied.

   (a) The rank of a matrix is invariant under elementary row or column operations

   (b) Two equivalent matrix have the same rank

   (c) Every matrix can be reduced to the normal form.

   (d) Row rank (A) = Column rank (A).

space in terms of its basis vec...

6. An orthogonal basis consisting of unit vectors is called an ...

   (a) Orthogonal basis (b) Orthogonal vector

   (c) Orthonormal basis (d) Orthonormal vector

7. A non-empty set V={u,v,w...} is said to be a vector space over a field F if it is satisfies the following condition:

   (a) Closure (b) Commutative

   (c) Associative (d) All of the above

8. The inverse of a linear transformation is...

   (a) linear (b) Non-linear

   (c) Singular (d) Non-singular

9. The system of linear equation are inconsistent is...

   (a) Infinite solution (b) Unique solution

   (c) No solution (d) all of the above

10. Which one of the following conditions is true?

    (a) The square matrix A and its transpose A^T have the same eigen values.

    (b) If λ is an eigen value of an orthogonal matrix then $\frac{1}{\lambda}$ is an eigen vector.

    (c) If $\lambda_1, \lambda_2, \ldots\ldots \lambda_n$ are the eigen values of a matrix A, then A^m *has the eigen values* $\lambda_1, \lambda_2, \ldots\ldots, \lambda_n$.

    (d) Zero is an eigen value of a square matrix A iff A is non-singular.

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