SNS COLLEGE OF ENGINEERING

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AN AUTONOMOUS INSTITUTION

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Puzzles
Unit I
Regulations 2023

1	If A is a 3x3 diagonal matrix, how do you find its eigenvalues? A) Solve the characteristic equation det⁡(A−λI)=0 B) The diagonal elements are the eigenvalues C) Multiply the diagonal elements to get eigenvalues D) None of the above	Ans.	☐
2.	A matrix B has eigenvalues $\lambda_1=2$ and $\lambda_2=5$ What is the trace of this matrix? (A)7 (B)10 (C)5 (D)2	Ans.	☐
3	Let C be a matrix where one eigenvalue is 0. What does this imply about the invertibility of the matrix? (A) Matrix is invertible (B) Matrix is not invertible (C) It has no inverse but is still diagonalizable (D) None of the above	Ans.	☐
4	If a matrix DDD has eigenvalues $\lambda_1=3, \lambda_2=1, \lambda_3=1$, what is the characteristic polynomial of the matrix? (A) (x−3)(x−1)2(x - 3)(x - 1)^2(x−3)(x−1)2 (B) (x−3)(x−2)(x−1)(x - 3)(x - 2)(x - 1)(x−3)(x−2)(x−1) (C) (x+3)(x−1)2(x + 3)(x - 1)^2(x+3)(x−1)2 (D) (x−3)(x−1)(x+1)(x - 3)(x - 1)(x + 1)(x−3)(x−1)(x+1)	Ans.	☐
5	If matrix E has an eigenvalue $\lambda=-1$ and is symmetric, what can you say about the remaining eigenvalues? (A) The remaining eigenvalues must also be negative (B) They can be either positive or negative (C) The remaining eigenvalues must be positive (D) They must all be 1	Ans.	☐
6	A diagonalizable matrix has eigenvalues 2,2,32, 2, 32,2,3. What can you infer about the algebraic and geometric multiplicity of the eigenvalue 2? A) Algebraic multiplicity = 2, geometric multiplicity = 1		☐

	B) Algebraic multiplicity = 1, geometric multiplicity = 2 C) Both algebraic and geometric multiplicity are 2 D) Both algebraic and geometric multiplicity are 1	**Ans.**	
7	If matrix S is diagonalizable and has three distinct eigenvalues, what can you say about its corresponding eigenvectors? A) Eigenvectors are linearly independent B) Eigenvectors are not unique C) Eigenvectors are always complex D) Eigenvectors are always equal	**Ans.**	
8	Find the nature (positive definite, negative definite, or indefinite) of the quadratic form $4x^2+y^2-6xy$ A) Positive definite B) Negative definite C) Indefinite D) Cannot determine	**Ans.**	
9	Prove that for any 2x2 matrix M,M^-1 can be written as a polynomial of M using the Cayley-Hamilton theorem. A) True B) False	**Ans.**	
10	If a quadratic form is given by $3x^2+5y^2+2z^2+2xy+4xz+6yz$ how do you determine its canonical form? A) Diagonalize the matrix B) Compute the eigenvalues C) Use an orthogonal transformation	**Ans.**	