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Eigen values and Eigen vectors

Answer the following questions. Each question carries ONE mark.

1. Find the coordinates a, b, c if $\alpha = (1, -2, -5)$ can be expressed as the linear combination of the vectors $e_1 = (1, 1, 1), e_2 = (1, 2, 3), e_3 = (2, -1, -1)$

   A. $a = -6, b = 3, c = 1$

   B. $a = -6, b = 3, c = 2$

   C. $a = -6, b = 3, c = 3$

   D. $a = -6, b = 3, c = 4$

2. The vectors (x_1, y_1) and (x_2, y_2) of $\mathbb{R}^2(\mathbb{R})$ are Linearly dependent if
   A. $x_1x_2 + y_1y_2 = 0$

   B. $x_1x_2 - y_1y_2 = 0$

   C. $x_1y_2 - x_2y_1 = 0$

   D. $x_1y_2 + x_2y_1 = 0$

3. Which of the following is true?

   A. Every subset of L.I set is L.I

   B. every super of L.D set L.D

   C. s is a subspace of $V(F) iff L(s) = s$

   D. ALL

4. GATE. The eigen values of the matrix $A = \begin{bmatrix} a & 1 \\ a & 1 \end{bmatrix}$ is

   A. $(a + 1), 0$

   B. $a, 0$

   C. $2(a - 1), 0$

   D. $0, 0$

5. GATE. The number of positive characteristics the matrix $A = \begin{bmatrix} a & 1 \\ a & 1 \end{bmatrix}$ is

   A. 1

B. 2

C. 3

D. Cannot be found

6. GATE.The eigen values of the matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$ is

A. $1, 2, 3$
B. $-1, -2, -3$
C. $0, -1, 7$
D. $0, 2, 4$

7. GATE.The eigen values of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is

A. $0, 0, 0$
B. $0, 0, 0$
C. $0, 0, 3$
D. $1, 1, 1$

8. GATE. If the vector $A = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}$ is an eigen vector of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ then one of the eigen value of A is

A. 1

B. 2

C. 4

D. 5

9. GATE. The eigen values of the matrix$A = \begin{bmatrix} 1 & 2 & 34 & 49 \\ 0 & 2 & 43 & 94 \\ 0 & 0 & -2 & 104 \\ 0 & 0 & 0 & -1 \end{bmatrix}$

A. $1, 2, -2, -1$

B. $-1, -2, -2, -1$

C. $1, 2, 2, 1$

D. None

10. GATE. The sum of the eigen values of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ is

A. 5

B. 7

C. 9

D. 18

11. GATE. The eigen values of the matrix A are $15, 3, 0$. $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$, the value of the determinant of a matrix is

A. 20

B. 10

C. 0

D. -10

12. GATE. For the matrix $A = \begin{bmatrix} 3 & -2 & 1 \\ 0 & -2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, one of the eigen value is -2. Which of the following is an eigen vector?

A. $\begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$

B. $\begin{bmatrix} -3 \\ 2 \\ -11 \end{bmatrix}$

C. $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$

D. $\begin{bmatrix} 2 \\ -5 \\ 0 \end{bmatrix}$

13. GATE. If The trace and determinant of a 2×2 matrix are $-2, -35$ the the eigen values are

A. $5, -7$

B. $-1, 35$

C. $9, -7$

D. $17.2, -2$

14. GATE.The smallest eigen value of the matrix $A = \begin{bmatrix} 3 & 5 & 2 \\ 5 & 12 & 7 \\ 2 & 7 & 5 \end{bmatrix}$,

    A. 0

    B. 1

    C. 2

    D. 3

15. GATE.The value of x for which the matrix $A = \begin{bmatrix} 3 & 2 & 4 \\ 9 & 7 & 13 \\ -6 & -4 & -9+x \end{bmatrix}$, has 0 as an eigen value

    A. 3

    B. 2

    C. 1

    D. 4

16. GATE. Suppose that the eigen values of matrix A are $1, 2, 4$. Then the determinant of $(A^{-1})^T$ is

    A. 8

    B. $\frac{1}{8}$

    C. -8

    D. $-\frac{1}{8}$

17. GATE. Let $A = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, and $B = A^3 - A^2 - 4A + 5I$ where I is the 3×3 identity matrix. Then the determinant of B is

    A. 4

    B. 3

    C. 2

    D. 1

18. GATE. The diagonal elements of a 3×3 are $-10, 5, 0$ respectively. If two of its eigen values are -15 each then the third eigen value is

    A. 50

    B. 0

C. 25

D. -25

19. Let A be a 3×3 matrix whose eigen values are $-1, 1, 2$. Then the value of α, β, γ such that $A^{-1} = \alpha A^2 + \beta A + \gamma$

A. $-\frac{1}{2}, 1, \frac{1}{2}$

B. $-\frac{1}{2}, -1, \frac{1}{2}$

C. $\frac{1}{2}, -1, -\frac{1}{2}$

D. $\frac{1}{2}, 1, -\frac{1}{2}$

20. Let A ba 5×5 matrix whose characteristic polynomial is given by $(\lambda - 2)^3(\lambda + 2)^2$. If A is diagonalizable then the value of α, β are

A. $-\frac{1}{2}, 0$

B. $\frac{1}{4}, 0$

C. $\frac{1}{2}, 1$

D. $\frac{1}{4}, -1$

21. Match the following matrices of the eigen values

1 . Symmetric Matrix	A) Unit modules
2. Skew- Symmetric Matrix	B) Rational Numbers
3. Hermition Matrix	C) Reals
4. Skew-hermition matrix	D)Zeros
5. Orthogonal and unitary matrix	E) Zero or purely imaginary
	F) Complex Numbers

A. $1, 3 - C, 2 - D, 4 - E, 5 - A$

B. $1, 3 - C, 2 - F, 4 - E, 5 - B$

C. $1, 3 - C, 2 - B, 4 - E, 5 - F$

D. $1, 3 - C, 2 - D, 4 - F, 5 - A$

22. Which of the following is true?

A. If A is a hermition matrix then iA is skew- hermition

B. If A is skew- hermition matrix then iA is hermition

C. If A is symmetric then $A + A^T$ is symmetric

D. If A is symmetric then $A - A^T$ is skew-symmetric

E. All

23. Which of the following is not true?

A. The eigen values of a idempotent matrices are $0, 1$

B. The eigen values of an involutary matrices are $1, -1$

C. The eigen values of a nilpotent matrices are zeros

D. None

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
B	C	D	A	D	B	C	D	A	B	C	D	A	A	C	B	D	C	A	B	A	E	D