Tick (√) the correct answer:

1. If λ_1, λ_2 and λ_3 are the eigen values of the matrix

$$\begin{bmatrix} -2 & -9 & 5 \\ -5 & -10 & 7 \\ -9 & -21 & 14 \end{bmatrix}$$ then $\lambda_1 + \lambda_2 + \lambda_3$ is equal to

(*i*) -16 (*ii*) 2 (*iii*) -6 (*iv*) -14

2. The matrix $A = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$ is given and the eigen values of $4A^{-1} + 3A + 2I$ are

(*i*) 6, 15 (*ii*) 9, 12 (*iii*) 9, 15 (*iv*) 7, 15

3. If a square matrix A has an eigen value λ, then an eigen value of the matrix $(kA)^T$ where k a scalar, is

(*i*) λ / k (*ii*) k / λ (*iii*) $k\lambda$ (*iv*) None of these

4. For the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ the sum of the eigen values is

(*i*) -1 (*ii*) 0 (*iii*) 3 (*iv*) 5

5. A 3×3 real matrix has an eigen value i then its other two eigen values can be

(*i*) 0, 1 (*ii*) -1, i (*iii*) $2i$, $-2i$ (*iv*) 0, $-i$

6. Let A be a square matrix. Then $\lambda = 0$ is an eigen value of A if and only if

(*i*) A is non-singular (*ii*) A is of even order

(*iii*) A is of odd order (*iv*) A is singular

7. The matrix A is defined as $A=\begin{bmatrix}-1 & 0 & 0\\ 2 & -3 & 0\\ 1 & 4 & 2\end{bmatrix}$. The eigen values of A^2 are

(*i*) $-1, -9, -4$ (*ii*) 1, 9, 4
(*iii*) $-1, -3, 2$ (*iv*) 1, 3, -2

8. If the matrix $A=\begin{bmatrix}-1 & 2 & 3\\ 0 & 3 & 5\\ 0 & 0 & -2\end{bmatrix}$ then the eigen values of $A^3 + 5A + 8I$, are

(*i*) $-1, 27, -8$ (*ii*) 1, 3, -2 (*iii*) 2, 50, -10 (*iv*) 2, 50, 10

9. Let P be a real square matrix of order n and n is odd. Then

(*i*) at least one eigen value of A is real (*ii*) one eigen value of A is zero
(*iii*) one eigen value of A is 1 (*iv*) A has no real eigen values

10. Two of the eigen values of a 3×3 matrix, whose determinant equals 4, are -1 and $+2$ the t value of the matrix is equal to

(*i*) -2 (*ii*) -1 (*iii*) 1 (*iv*) 2

11. The matrix A has eigen values $\lambda_i \neq 0$. Then $A^{-1} - 2I + A$ has eigen values

(*i*) $1+2\lambda_i+\lambda_i^2$ (*ii*) $\frac{1}{\lambda_i}-2+\lambda_i$ (*iii*) $1-2\lambda_i+\lambda_i^2$ (*iv*) $1-\frac{2}{\lambda_i}+$

12. The eigen values of a matrix A are 1, -2, 3. The eigen values of $3I - 2A + A^2$ are

(*i*) 2, 11, 6 (*ii*) 3, 11, 18 (*iii*) 2, 3, 6 (*iv*) 6, 3, 11

13. If A is a singular hermitian matrix, then the least eigen value of A^2 is

(*i*) 0 (*ii*) 1 (*iii*) 2 (*iv*) None of t

14. If λ is an eigen value of the matrix 'M' then for the matrix $(M - \lambda I)$, which of the following (*s*) is/are coorrect ?

(*i*) Skew symmetric (*ii*) Non singular (*iii*) Singular (*iv*) None of these

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15. If A is a skew symmetric matrix, then for all vectors X, $X^T A X$ has a value

(*i*) 0 (*ii*) greater than zero
(*iii*) purely imaginary (*iv*) equal to the largest eigen value of A.

16. A square matrix A is idempotent if :

(*i*) $A' = A$ (*ii*) $A' = -A$ (*iii*) $A^2 = A$ (*iv*) $A^2 = I$

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17. If a square matrix U such that $\overline{U}' = U^{-1}$ then U is

(*i*) Orthogonal (*ii*) Unitary (*iii*) Symmetric (*iv*) Hermitian

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18. The sum of the eigen values of $\begin{pmatrix}1 & 0 & 0\\ 0 & 3 & -1\\ 0 & -1 & 3\end{pmatrix}$ is equal to

(*i*) 6 (*ii*) -8 (*iii*) 7 (*iv*) -6 A

19. If λ is an eigen value of a non-singular matrix A then the eigen value of A^{-1} is

(*i*) $1/\lambda$ (*ii*) λ (*iii*) $-\lambda$ (*iv*) $-1/\lambda$ A

20. The product of the eigen values of the matrix

$$A=\begin{pmatrix}1 & 0 & 0\\ 0 & 3 & -1\\ 0 & -1 & 3\end{pmatrix}$$ is

(*i*) 3 (*ii*) 8 (*iii*) 1 (*iv*) – 1 An

21. If $A=\begin{bmatrix}-1 & 2 & 3\\ 0 & 3 & 5\\ 0 & 0 & -2\end{bmatrix}$, then the eigen value of A^2 are

(*i*) 1, 2, 3 (*ii*) –1, 2, 3 (*iii*) 1, 4, 9 (*iv*) – 1, 4, 9 An

22. The eigenvalues of the matrix $\begin{bmatrix}1 & 1 & -2\\ -1 & 2 & 1\\ 0 & 1 & -1\end{bmatrix}$ are

(*i*) –1, 2 and 1 (*ii*) 0, 1 and 2 (*iii*) –1, –2 and 4 (*iv*) 1, 1 and–1 A

Considering the following choose the correct alternative:

$A=\begin{bmatrix}1 & 0 & 0\\ 2 & 1 & 0\\ 3 & 2 & 1\end{bmatrix}$ if U_1, U_2 and U_3 are columns matrices satisfying.

$AU_1=\begin{bmatrix}1\\ 0\\ 0\end{bmatrix}, AU_2=\begin{bmatrix}2\\ 3\\ 0\end{bmatrix}, AU_3=\begin{bmatrix}2\\ 3\\ 1\end{bmatrix}$ and U is 3 × 3 matrix whose columns are U_1, U_2, U

answer the following equations.

23. The value of $|U|$ is

(*i*) 3 (*ii*) –3 (*iii*) $\frac{3}{2}$ (*iv*) 2 A

[**Hint :** Let U_1 be $\begin{bmatrix}x\\ y\\ z\end{bmatrix}$ so that

$$\begin{bmatrix}1 & 0 & 0\\ 2 & 1 & 0\\ 3 & 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ 0\\ 0\end{bmatrix} \quad \Rightarrow \quad \begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ -2\\ 1\end{bmatrix}$$

Similarly, $U_2=\begin{bmatrix}2\\ -1\\ -4\end{bmatrix}$, $U_3=\begin{bmatrix}2\\ -1\\ -3\end{bmatrix}$

Hence, $U=\begin{bmatrix}1 & 2 & 2\\ -2 & -1 & -1\\ 1 & -4 & -3\end{bmatrix}$ and $|U|=3$.

24. The sum of the elements of U^{-1} is

(*i*) –1 (*ii*) 0 (*iii*) 1 (*iv*) 3 A

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[Hint : Moreover adj. $U = \begin{bmatrix} -1 & -2 & 0 \\ -7 & -5 & -3 \\ 9 & 6 & 3 \end{bmatrix}$.

Hence, $U^{-1} = \frac{adj\, U}{3}$ and sum of the elements of $U^{-1} = 0$]

(ii)

25. The value of $[3\ 2\ 0]\ U \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$ is

ii)

(i) 5 (ii) $\frac{5}{2}$ (iii) 4 (iv) $\frac{3}{2}$

[Hint : The value of $[3\ 2\ 0]\ U \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$

$= [3\,2\,0] \begin{bmatrix} 1 & 2 & 2 \\ -2 & -1 & -1 \\ 1 & -4 & -3 \end{bmatrix} \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix} = [-1\ 4\ 4] \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix} = -3 + 8 = 5$]

Fill up the blanks.

26. If the eigen values of the matrix A are 1, 2, 3 then, the eigen values of $(A.\ I^2)$ are .....

Ans

27. The eigen values of A are 2,. 3, 4 then the eigen values of A^2 are .....

An

28. The eigen values of A are 2, 3, 1 then the eigne values of $A^2 + A$ are .....

An

29. If the eigen values of A are 1, 1, 1 then the eigen values of $A^2 + 2A + 3I$ are.....

An

30. If the eigen values of A are 4, 6, 9 then the eigen values of A^{-1} are .....

A

Indicate True of False for the following:

31. The elements of modal matrix are the eigen vectors of the corresponding eigen values.

32. $P^{-1} AP$ = The diagonal matrix.

33. $A^6 = PD^6 P^{-1}$

34. If $A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$ then $A^{100} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

35. If $A = \begin{bmatrix} 1 & -2 & -3 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then $A^{-1} = \begin{bmatrix} 1 & 1 & 1 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

36. Conjugate of 2 is 2.

37. Conjugate of i is $-i$.

38. If the eigen value of A is 2, then the eigen value of $A^3 + 2A^2 + A + I$ is 10.

Fill up the blanks:

39. The characteristic roots of a skew hermitian matrix is eighter..... or ..... Ans.

40. The modulus of each characteristic roots of a unitary matrix is ..... **Ans.**

41. If λ is an eigen value of an orthogonal matrix, then the other eigen value of the same is ..... **Ans.**

42. The characteristic roots of a Hermitian matrix or all..... **Ans.**

43. The characteristic root of a triangular matrix is ..... **Ans.**

44. If a characteristic roots of a matrix is zero, then the matrix is ..... **Ans.**

45. If A and P be square matrices of the same type and if P is investible, then the matr have ..... characteristic roots. **Ans.**