



Practice Session on Calculus - Part II

Revision Course on Engineering Mathematics - GATE, CS & IT

Linear Algebra DPP

Use the code : BVREDDY, to get the maximum discount

1. The matrix $A = \begin{bmatrix} a & 0 & 3 & 7 \\ 2 & 5 & 1 & 3 \\ 0 & 0 & 2 & 4 \\ 0 & 0 & 0 & b \end{bmatrix}$ has $\det(A) = 100$ and $\text{trace}(A) = 14$. The value of $|a - b|$ is _____.

(GATE-16-EC)

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2. The value of x for which the matrix

$$A = \begin{bmatrix} 3 & 2 & 4 \\ 9 & 7 & 13 \\ -6 & -4 & -9 + x \end{bmatrix}$$

has zero as an eigen value is _____.

(GATE-16-EC)

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3. Consider a 2×2 square matrix

$$A = \begin{bmatrix} \sigma & x \\ \omega & \sigma \end{bmatrix}$$

Where x is unknown. If the eigen values of the matrix A are $(\sigma + j\omega)$ and $(\sigma - j\omega)$, then x is equal to

- (a) $+j\omega$
- (b) $-j\omega$
- (c) $+\omega$
- (d) $-\omega$

(GATE-16-EC)

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4. Consider 3×3 matrix with every element being equal to 1. Its only non-zero eigenvalue is

(GATE-16-EE)

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5. A 3×3 matrix P is such that, $P^3 = P$. Then the eigen values of P are

(GATE-16-EE)

- (a) 1, 1, -1
- (b) 1, $0.5 + j0.866$, $0.5 - j0.866$
- (c) 1, $-0.5 + j0.866$, $-0.5 - j0.866$
- (d) 0, 1, -1

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6. Consider the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 2 & 3 & 4 \\ -1 & -1 & -2 \end{pmatrix}$ whose eigen values are 1, -1 and 3. Then trace of $(A^3 - 3A^2)$ is _____. **(GATE-16-IN)**

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7. The condition for which the eigen values of matrix $A = \begin{bmatrix} 2 & 1 \\ 1 & k \end{bmatrix}$ are positive, is

- (a) $k > \frac{1}{2}$ (b) $k > -2$ (c) $k > 0$ (d) $k < -\frac{1}{2}$

(GATE-16-ME)

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8. A real square matrix A is called skew-symmetric if

- (a) $A^T = A$
- (b) $A^T = A^{-1}$
- (c) $A^T = -A$
- (d) $A^T = A + A^{-1}$

(GATE-16-ME)

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9. The eigen values of the matrix are $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

- (a) i and $-i$
- (b) 1 and -1
- (c) 0 and 1
- (d) 0 and -1

(GATE-16-PI)

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10. The number of solutions of the simultaneous algebraic equations $y = 3x + 3$ and $y = 3x + 5$ is

- (a) zero
- (b) 1
- (c) 2
- (d) infinite

(GATE-16-PI)

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11. Two eigen values of a 3×3 real matrix P are $(2 + \sqrt{-1})$ and 3. The determinant of P is _____.

(GATE-16-CSE)

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

(GATE-16-CSE)

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13. Let A_1 , A_2 , A_3 and A_4 be four matrices of dimensions 10×5 , 5×20 , 20×10 and 10×5 , respectively. The minimum number of scalar multiplications required to find the product $A_1A_2A_3A_4$ using the basic matrix multiplication method is _____.

(GATE-16-CSE)

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14. The eigen values of the matrix

$$A = \begin{bmatrix} 1 & -1 & 5 \\ 0 & 5 & 6 \\ 0 & -6 & 5 \end{bmatrix}$$
 are

(GATE-17-IN)

- (a) -1, 5, 6
- (b) $1, -5 \pm j6$
- (c) $1, 5 \pm j6$
- (d) 1, 5, 5

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15. The figure shows a shape ABC and its mirror image $A_1B_1C_1$ across the horizontal axis (x-axis). The coordinate transformation matrix that maps ABC to $A_1B_1C_1$ is

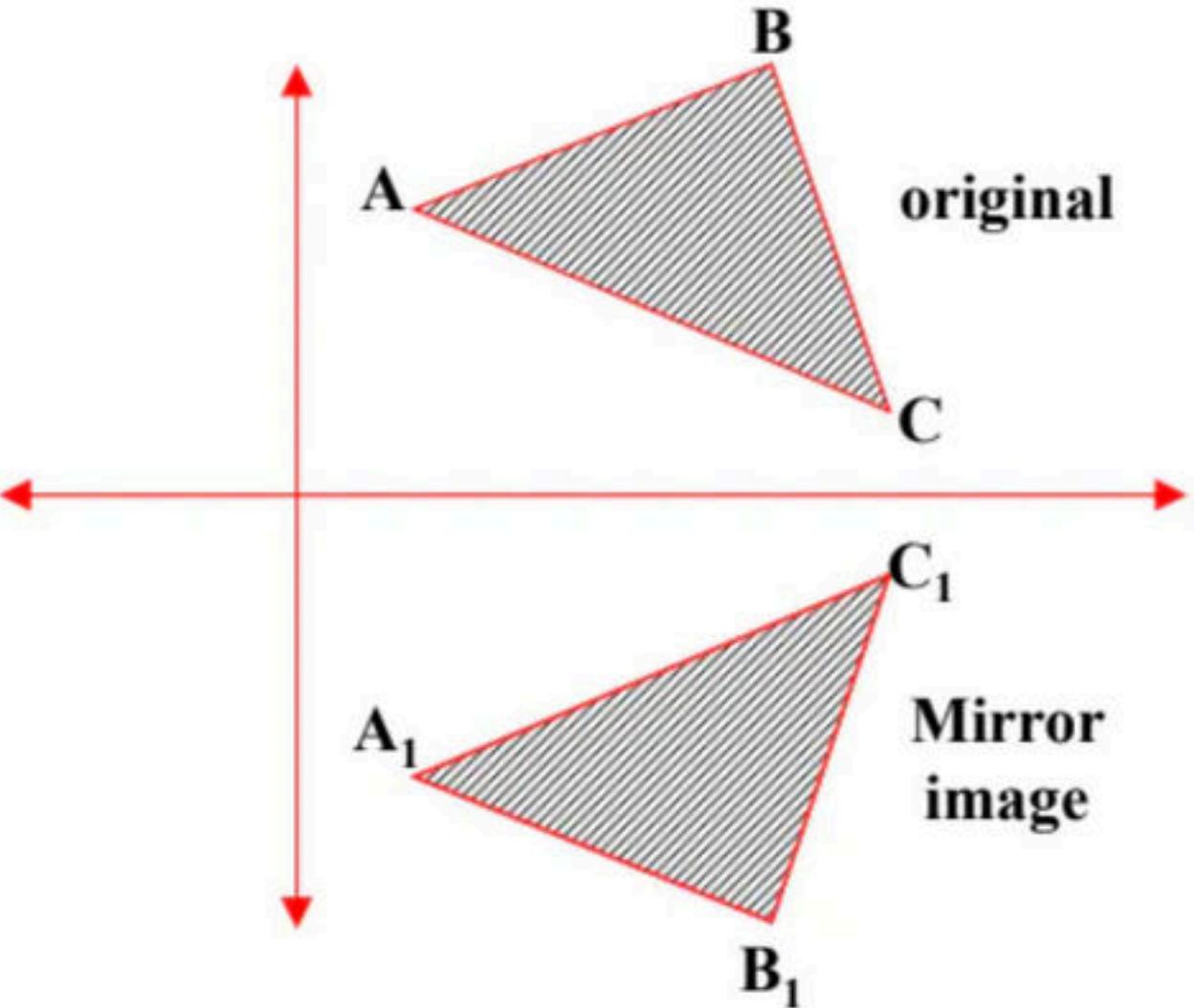
(GATE-17-IN)

(a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$



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16. Consider the 5×5 matrix

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 1 & 2 & 3 & 4 \\ 4 & 5 & 1 & 2 & 3 \\ 3 & 4 & 5 & 1 & 2 \\ 2 & 3 & 4 & 5 & 1 \end{bmatrix}$$

It is given that A has only one real eigen value. Then the real eigen value of A is

- (a) -2.5
- (b) 0
- (c) 15
- (d) 25

(GATE-17-EC)

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17. The eigen values of the matrix given below

$$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -3 & -4 \end{bmatrix}$$
 are

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

(GATE-17-EE)

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18. The product of eigen values of the matrix P

$$P = \begin{bmatrix} 2 & 0 & 1 \\ 4 & -3 & 3 \\ 0 & 2 & -1 \end{bmatrix}$$
 is

- (a) -6
- (b) 2
- (c) 6
- (d) -2

(GATE-17-ME)

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19. The determinant of a 2×2 matrix is 50. If one eigen value of the matrix is 10, the other eigen value is _____.

(GATE-17-ME)

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20. Consider the matrix $A = \begin{bmatrix} 50 & 70 \\ 70 & 80 \end{bmatrix}$ whose eigen values λ_1 and λ_2 are $x_1 = \begin{bmatrix} 70 \\ \lambda_1 - 50 \end{bmatrix}$ and $x_2 = \begin{bmatrix} \lambda_2 - 80 \\ 70 \end{bmatrix}$, respectively. The value of $x_1^T x_2$ is _____

(GATE-17-ME)

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21. Consider the following simultaneous equations (with c_1 and c_2 being constants):

$$3x_1 + 2x_2 = c_1$$

$$4x_1 + x_2 = c_2$$

The characteristic equation for these simultaneous equations is

(GATE-17-CE)

(a) $\lambda^2 - 4\lambda - 5 = 0$

(c) $\lambda^2 + 4\lambda - 5 = 0$

(b) $\lambda^2 - 4\lambda + 5 = 0$

(d) $\lambda^2 + 4\lambda + 5 = 0$

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22. If $A = \begin{bmatrix} 1 & 5 \\ 6 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 7 \\ 8 & 4 \end{bmatrix}$ then AB^T is equal to

(a) $\begin{bmatrix} 38 & 28 \\ 32 & 56 \end{bmatrix}$

(b) $\begin{bmatrix} 3 & 40 \\ 42 & 8 \end{bmatrix}$

(c) $\begin{bmatrix} 43 & 27 \\ 34 & 50 \end{bmatrix}$

(d) $\begin{bmatrix} 38 & 32 \\ 28 & 56 \end{bmatrix}$

(GATE-17-CE)

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23. The matrix P is the inverse of a matrix Q. If I denote the identity matrix, which one of the following options is correct?

- (a) $PQ = I$ but $QP \neq I$
- (b) $QP = I$ but $PQ \neq I$
- (c) $PQ = I$ and $QP = I$
- (d) $PQ - QP = I$

(GATE-17-CE)

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24. Consider the matrix $\begin{bmatrix} 5 & -1 \\ 4 & 1 \end{bmatrix}$. Which one of the following statements is TRUE for the eigenvalues and eigenvectors of this matrix?

(GATE-17-CE)

- (a) eigenvalue 3 has a multiplicity of 2, and only one independent eigenvector exists.
- (b) eigenvalue 3 has a multiplicity of 2, and two independent eigenvectors exist.
- (c) eigenvalue 3 has a multiplicity of 2, and no independent eigenvector exists.
- (d) eigenvalues are 3 and -3, and two independent eigenvectors exist

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25. If the characteristic polynomial of a 3×3 matrix M over R (the set of real numbers) is $\lambda^3 - 4\lambda^2 + a\lambda + 30$. $a \in \mathbb{R}$, and one eigenvalue of M is 2, then the largest among the absolute values of the eigenvalues of M is _____.

(GATE-17-CSIT)

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$$26. \text{ Consider the matrix } P = \begin{bmatrix} \frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \\ 0 & 1 & 0 \\ -\frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \end{bmatrix}.$$

Which one of the following statements about P is INCORRECT?

(GATE-17-ME)

- (a) Determinant of P is equal to 1
- (b) P is orthogonal
- (c) Inverse of P is equal to its transpose
- (d) All eigen values of P are real numbers

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27. For the given orthogonal matrix Q,

$$Q = \begin{bmatrix} 3/7 & 2/7 & 6/7 \\ -6/7 & 3/7 & 2/7 \\ 2/7 & 6/7 & -3/7 \end{bmatrix}$$

The inverse is

(GATE-18-CE)

$$(a) Q = \begin{bmatrix} 3/7 & 2/7 & 6/7 \\ -6/7 & 3/7 & 2/7 \\ 2/7 & 6/7 & -3/7 \end{bmatrix}$$

$$(b) Q = \begin{bmatrix} -3/7 & -2/7 & 6/7 \\ 6/7 & -3/7 & -2/7 \\ -2/7 & -6/7 & 3/7 \end{bmatrix}$$

$$(c) Q = \begin{bmatrix} 3/7 & -6/7 & 2/7 \\ 2/7 & 3/7 & 6/7 \\ 6/7 & 2/7 & -3/7 \end{bmatrix}$$

$$(d) Q = \begin{bmatrix} -3/7 & 6/7 & -2/7 \\ -2/7 & -3/7 & -6/7 \\ -6/7 & -2/7 & 3/7 \end{bmatrix}$$

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28. Which one of the following matrices is singular?

(GATE-18-CE)

(a) $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

(b) $\begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$

(d) $\begin{bmatrix} 4 & 3 \\ 6 & 2 \end{bmatrix}$

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29. Consider matrix $A = uv^T$

Where, $u = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$, $v = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$.

Note that v^T denotes the transpose of v . The largest eigen value of A is _____.

(GATE-18-CSIT)

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30. Consider a non-singular 2×2 square matrix A. If $\text{trace}(A) = 4$ and $\text{trace}(A^2) = 5$, the determinant of the matrix A is _____. (Up to 1 decimal place)

(GATE-18-EC)

Use the code : BVREDDY, to get the maximum discount

31. Let N be a 3 by 3 matrix with real number entries. The matrix N is such that $N^2 = 0$. The eigen values of N are

- (a) 0, 0, 0
- (b) 0, 0, 1
- (c) 0, 1, 1

(GATE-18-IN)

Use the code : BVREDDY, to get the maximum discount

32. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 1 \end{bmatrix}$ then $\det(A^{-1})$ is _____ (correct to two decimal places).

(GATE-18-ME)

Use the code : BVREDDY, to get the maximum discount

33. The diagonal elements of a 3 by 3 matrix are -10, 5, and 0, respectively. If two of its eigenvalues are -15 each, the third eigen value is _____.

(GATE-18-PI)

Use the code : BVREDDY, to get the maximum discount

34. A 3×3 matrix has eigen values 1, 2, and 5. The determinant of the matrix is _____.
(GATE-19-INST)

Use the code : BVREDDY, to get the maximum discount

35. Consider the following matrix: $R = \begin{bmatrix} 1 & 2 & 4 & 8 \\ 1 & 3 & 9 & 27 \\ 1 & 4 & 16 & 64 \\ 1 & 5 & 25 & 125 \end{bmatrix}$
The absolute value of the product of Eigen values of R is _____. (GATE-19-CSIT)

Use the code : BVREDDY, to get the maximum discount

36. M is a 2×2 matrix with eigen values 4 and 9. The eigen values of M^2 are

(GATE-19-EE)

- (a) 2 and 3
- (b) -2 and -3
- (c) 4 and 9
- (d) 16 and 81

Use the code : BVREDDY, to get the maximum discount

37. Consider a 2×2 matrix $M = [v_1, v_2]$, where, v_1 and v_2 are the column vectors.

Suppose $M^{-1} = \begin{bmatrix} u_1^T \\ u_2^T \end{bmatrix}$, where u_1^T and u_2^T are the row vectors.

Consider the following statements:

Statement 1: $u_1^T v_1 = 1$ and $u_2^T v_2 = 1$

Statement 2: $u_1^T v_2 = 0$ and $u_2^T v_1 = 0$

Which of the following options is correct?

- (a) Statement 2 is true and statement 1 is false
- (b) Both the statements are false
- (c) Statement 1 is true and statement 2 is false
- (d) Both the statements are true

(GATE-19-EE)

Use the code : BVREDDY, to get the maximum discount

38. For any real, square and non-singular matrix B, the $\det B^{-1}$ is

- (a) zero
- (b) $(\det B)^{-1}$
- (c) $-(\det B)$
- (d) $\det B$

(GATE-19-ME)

Use the code : BVREDDY, to get the maximum discount

39. Consider the matrix $P = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

The number of distinct eigen values of P is

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

(GATE-19-ME)

Use the code : BVREDDY, to get the maximum discount

40. The inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ is

(GATE-19-CE)

(a) $\begin{bmatrix} -10 & 4 & 9 \\ 15 & -4 & -14 \\ -5 & 1 & 6 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & -\frac{4}{5} & -\frac{9}{5} \\ -3 & \frac{4}{5} & \frac{14}{5} \\ 1 & -\frac{1}{5} & -\frac{6}{5} \end{bmatrix}$

(c) $\begin{bmatrix} -2 & -\frac{4}{5} & \frac{9}{5} \\ 3 & -\frac{4}{5} & -\frac{14}{5} \\ -1 & \frac{1}{5} & \frac{6}{5} \end{bmatrix}$

(d) $\begin{bmatrix} 10 & -4 & -9 \\ -15 & 4 & 14 \\ 5 & -1 & -6 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

41. Let A_1 , A_2 , A_3 and A_4 be four matrices of dimensions 10×5 , 5×20 , 20×10 and 10×5 , respectively. The minimum number of scalar multiplications required to find the product $A_1A_2A_3A_4$ using the basic matrix multiplication method is _____.

(GATE-20-ME)

Use the code : BVREDDY, to get the maximum discount

42. A 4×4 matrix [P] is given below

$$[P] = \begin{bmatrix} 0 & 1 & 3 & 0 \\ -2 & 3 & 0 & 4 \\ 0 & 0 & 6 & 1 \\ 0 & 0 & 1 & 6 \end{bmatrix}$$

The eigen values of [P] are

- (a) 0, 3, 6, 6
- (b) 1, 2, 3, 4
- (c) 1, 2, 5, 7
- (d) 3, 4, 5, 7

(GATE-2020(CE))

Use the code : BVREDDY, to get the maximum discount

43. If $P = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $Q = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then $Q^T P^T$ is

(GATE-21-CE)

(a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$

(d) $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

44. If A is a square matrix then orthogonality property mandates

(GATE-21-CE)

- (a) $AA^T = I$
- (b) $AA^T = 0$
- (c) $AA^T = A^{-2}$
- (d) $AA^T = A^2$

Use the code : BVREDDY, to get the maximum discount

45. Let p and q be real numbers such that $p^2 + q^2 = 1$. The eigenvalues of the matrix $\begin{bmatrix} p & q \\ q & -p \end{bmatrix}$

are

- | | | |
|----------------|--------------|--------------|
| (a) pq and -pq | (b) 1 and 1 | (GATE-21-EE) |
| (c) j and -j | (d) 1 and -1 | |

Use the code : BVREDDY, to get the maximum discount

46. Consider the following matrix :

$$\begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix}$$

The largest eigenvalue of the above matrix is _____.

(GATE-2021-cs)

Use the code : BVREDDY, to get the maximum discount

47. A real 2×2 non-singular matrix A with repeated eigenvalue is given as

$$A = \begin{bmatrix} x & -3.0 \\ 3.0 & 4.0 \end{bmatrix}$$

where x is a real positive number . The value of x (rounded off to one decimal place) is _____.

(GATE – 2021 – EC)

Use the code : BVREDDY, to get the maximum discount

48. The determinant of the matrix M shown below is _____.

$$M = \begin{bmatrix} 1 & 2 & 0 & 0 \\ 3 & 4 & 0 & 0 \\ 0 & 0 & 4 & 3 \\ 0 & 0 & 2 & 1 \end{bmatrix}$$

(GATE – 2021 – IN)

Use the code : BVREDDY, to get the maximum discount

49. The eigen vector (s) of the matrix

$$\begin{bmatrix} 0 & 0 & \alpha \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \alpha \neq 0 \text{ is (are)}$$

(GATE – 93)

- (a) (0, 0, α)
- (b) (α , 0, 0)
- (c) (0, 0, 1)
- (d) (0, α , 0)

Use the code : BVREDDY, to get the maximum discount

50. If A and B are real symmetric matrices of order n then which of the following is true.

(GATE – 94[CS])

- (a) $A A^T = I$
- (b) $A = A - 1$
- (c) $AB = BA$
- (d) $(AB)^T = B^T A^T$

Use the code : BVREDDY, to get the maximum discount

51. The inverse of the matrix $S = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$
is **(GATE – 95[EE])**

(a) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & 1 & 1 \\ -1 & -1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 2 & -2 \\ -2 & 2 & -2 \\ 0 & 2 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{-1}{2} \\ \frac{-1}{2} & \frac{1}{2} & \frac{-1}{2} \\ 0 & 0 & 1 \end{bmatrix}$

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52. The eigen values of the matrix $\begin{bmatrix} a & 1 \\ a & 1 \end{bmatrix}$ are

(GATE - 94[EE])

- (a) $(a + 1), 0$
- (b) $a, 0$
- (c) $(a - 1), 0$
- (d) $0, 0$

Use the code : BVREDDY, to get the maximum discount

53. The matrix $\begin{bmatrix} 1 & -4 \\ 1 & -5 \end{bmatrix}$ is an inverse of the

matrix $\begin{bmatrix} 5 & -4 \\ 1 & -1 \end{bmatrix}$ **(GATE – 94[PI])**

(a) True

(b) False

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54. The value of the following determinant

$$\begin{vmatrix} 1 & 4 & 9 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{vmatrix}$$

is **(GATE - 94[PI])**

- (a) 8
- (b) 12
- (c) -12
- (d) -8

Use the code : BVREDDY, to get the maximum discount

55. For the following matrix $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ the number of real positive characteristic roots is

(GATE - 94 [PI])

Use the code : BVREDDY, to get the maximum discount

56. Given matrix $L = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 4 & 5 \end{bmatrix}$ and $M = \begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}$

then $L \times M$ is

(GATE - 95[PI])

(a) $\begin{bmatrix} 8 & 1 \\ 13 & 2 \\ 22 & 5 \end{bmatrix}$

(b) $\begin{bmatrix} 6 & 5 \\ 9 & 8 \\ 12 & 13 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 8 \\ 2 & 13 \\ 5 & 22 \end{bmatrix}$

(d) $\begin{bmatrix} 6 & 2 \\ 9 & 4 \\ 0 & 5 \end{bmatrix}$

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57.

Inverse of matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ is

(GATE – 97[CE])

(a) $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

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58. Given the matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$. Its eigen values are (GATE – 95[EE])

- a) 1, 2, 3
- b)-1, -2 , -3
- c)1 ,-2 , 3
- d)-1 ,-2 ,3

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59. The matrices $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ and $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$

commute under multiplication.

(GATE – 96[CS])

- (a) If $a = b$ (or) $\theta = n\pi$, n is an integer
- (b) always
- (c) never
- (d) If $a \cos\theta \neq b \sin\theta$

Use the code : BVREDDY, to get the maximum discount

60. Let $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ and $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$ be two matrices such that $AB = I$.

Let $C = A \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $CD = I$.

Express the elements of D in terms of the elements of B.

Use the code : BVREDDY, to get the maximum discount

61. The eigen values of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ are

(GATE – 96[ME])

- (a) 0, 0, 0
- (b) 0, 0, 1
- (c) 0, 0, 3
- (d) 1, 1, 1

Use the code : BVREDDY, to get the maximum discount

62. If the determinant of the matrix

$$\begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & -6 \\ 2 & 7 & 8 \end{bmatrix}$$
 is 26, then the determinant of

$$\text{the matrix } \begin{bmatrix} 2 & 7 & 8 \\ 0 & 5 & -6 \\ 1 & 3 & 2 \end{bmatrix}$$
 is

(GATE - 97[CE])

- (a) - 26
- (b) 26
- (c) 0
- (d) 52

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63. If A and B are two matrices if both AB and BA exists

- a) Only if A has as many rows as B has columns
- b) Only if the order of A and B are same
- c) Only if A and B are skew symmetric
- d) Only if both A and B are symmetric

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64. The determinant of the matrix

$$\begin{bmatrix} 6 & -8 & 1 & 1 \\ 0 & 2 & 4 & 6 \\ 0 & 0 & 4 & 8 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

is

(GATE - 97[CS])

- (a) 11
- (c) 0

- (b) - 48
- (d) - 24

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65. If $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ then which of the following is a factor of Δ .

(GATE - 98[CS])

- (a) $a + b$
- (b) $a - b$
- (c) abc
- (d) $a + b + c$

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66. If A is a real square matrix then AA^T is
(GATE – 98[CE])

- (a) un symmetric
- (b) always symmetric
- (c) skew – symmetric
- (d) some times symmetric

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67. In matrix algebra $AS = AT$ (A, S, T , are matrices of appropriate order) implies

$S = T$ only if

(GATE - 98[CE])

- (a) A is symmetric
- (b) A is singular
- (c) A is non-singular
- (d) A is skew-symmetric

Use the code : BVREDDY, to get the maximum discount

68. The eigen values of the matrix $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

are

(GATE - 98[EC])

- (a) 1, 1
- (b) -1, -1
- (c) $j, -j$
- (d) 1, -1

Use the code : BVREDDY, to get the maximum discount

69.

$$A = \begin{bmatrix} 2 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ -1 & 0 & 0 & 4 \end{bmatrix}$$

The sum of the eigen

values of the matrix A is

(GATE – 98[EE])

- (a) 10
- (b) -10
- (c) 24
- (d) 22

Use the code : BVREDDY, to get the maximum discount

70.

$$\text{If } A = \begin{bmatrix} 5 & 0 & 2 \\ 0 & 3 & 0 \\ 2 & 0 & 1 \end{bmatrix} \text{ then } A^{-1} =$$

(GATE - 98[EE])

(a) $\begin{bmatrix} 1 & 0 & -2 \\ 0 & 1/3 & 0 \\ -2 & 0 & 5 \end{bmatrix}$

(b) $\begin{bmatrix} 5 & 0 & 2 \\ 0 & -1/3 & 0 \\ 2 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1/5 & 0 & 1/2 \\ 0 & 1/3 & 0 \\ 1/2 & 0 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 1/5 & 0 & -1/2 \\ 0 & 1/3 & 0 \\ -1/2 & 0 & 1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

71.

If $A = \begin{bmatrix} 1 & -2 & -1 \\ 2 & 3 & 1 \\ 0 & 5 & -2 \end{bmatrix}$ and

$\text{adj}(A) = \begin{bmatrix} -11 & -9 & 1 \\ 4 & -2 & -3 \\ 10 & k & 7 \end{bmatrix}$ then $k =$

(GATE - 99)

- | | |
|--------|-------|
| (a) -5 | (b) 3 |
| (c) -3 | (d) 5 |

Use the code : BVREDDY, to get the maximum discount

72.

If A is any $n \times n$ matrix and k is a scalar then

$|kA| = \alpha |A|$ where α is

(GATE-99[CE])

- (a) kn
- (b) n^k
- (c) k^n
- (d) $\frac{k}{n}$

Use the code : BVREDDY, to get the maximum discount

73. The number of terms in the expansion of general determinant of order n is

(GATE – 99[CE])

- (a) n^2
- (b) $n!$
- (c) n
- (d) $(n + 1)^2$

Use the code : BVREDDY, to get the maximum discount

74. The equation

$$\begin{vmatrix} 2 & 1 & 1 \\ 1 & 1 & -1 \\ y & x^2 & x \end{vmatrix} = 0$$

represents a parabola passing through the points.

(GATE – 99[CE])

- (a) (0, 1), (0, 2), (0, -1)
- (b) (0, 0), (-1, 1), (1, 2)
- (c) (1, 1), (0, 0), (2, 2)
- (d) (1, 2), (2, 1), (0, 0)

Use the code : BVREDDY, to get the maximum discount

75. An $n \times n$ array V is defined as follows

$v[i,j] = i - j$ for all i, j , $1 \leq i, j \leq n$ then the sum of the elements of the array V is

(GATE-2000[CS])

- (a) 0
- (b) $n - 1$
- (c) $n^2 - 3n + 2$
- (d) $n(n + 1)$

Use the code : BVREDDY, to get the maximum discount

76. The determinant of the matrix

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 8 & 1 & 7 & 2 \\ 2 & 0 & 2 & 0 \\ 9 & 0 & 6 & 1 \end{bmatrix}$$

is **(GATE-2000[CS])**

- (a) 4 (b) 0 (c) 15 (d) 20

Use the code : BVREDDY, to get the maximum discount

77. If A, B, C are square matrices of the same order then $(ABC)^{-1}$ is equal to

(GATE-2000[CE])

- (a) $C^{-1} A^{-1} B^{-1}$
- (b) $C^{-1} B^{-1} A^{-1}$
- (c) $A^{-1} B^{-1} C^{-1}$
- (d) $A^{-1} C^{-1} B^{-1}$

Use the code : BVREDDY, to get the maximum discount

78. The eigen values of the matrix

$$\begin{bmatrix} 2 & -1 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & -2 & 0 \\ 0 & 0 & -1 & 4 \end{bmatrix} \text{ are}$$

(GATE-2000[EC])

- (a) 2, -2, 1, -1
- (b) 2, 3, -2, 4
- (c) 2, 3, 1, 4
- (d) None

Use the code : BVREDDY, to get the maximum discount

79. Consider the following statements

S₁: The sum of two singular matrices may

be singular.

S₂: The sum of two non-singular may be

non-singular.

Which of the following statements is true?

(GATE-01[CS])

- (a) S₁ & S₂ are both true
- (b) S₁ & S₂ are both false
- (c) S₁ is true and S₂ is false
- (d) S₁ is false and S₂ is true

Use the code : BVREDDY, to get the maximum discount

80. The determinant of the following matrix

$$\begin{bmatrix} 5 & 3 & 2 \\ 1 & 2 & 6 \\ 3 & 5 & 10 \end{bmatrix}$$

(GATE- 01[CE])

- (a) - 76
- (b) - 28
- (c) 28
- (d) 72

Use the code : BVREDDY, to get the maximum discount

81. The eigen values of the matrix $\begin{bmatrix} 5 & 3 \\ 2 & 9 \end{bmatrix}$ are

(GATE-01[CE])

- (a) (5.13, 9.42)
- (b) (3.85, 2.93)
- (c) (9.00, 5.00)
- (d) (10.16, 3.84)

Use the code : BVREDDY, to get the maximum discount

82. The product $[P][Q]^T$ of the following two matrices [P] and [Q]

where $[P] = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, $[Q] = \begin{bmatrix} 4 & 8 \\ 9 & 2 \end{bmatrix}$ is

(GATE-01[CE])

(a) $\begin{bmatrix} 32 & 24 \\ 56 & 46 \end{bmatrix}$

(b) $\begin{bmatrix} 46 & 56 \\ 24 & 32 \end{bmatrix}$

(c) $\begin{bmatrix} 35 & 22 \\ 61 & 42 \end{bmatrix}$

(d) $\begin{bmatrix} 32 & 56 \\ 24 & 46 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

83. Obtain the eigen values of the matrix

$$A = \begin{bmatrix} 1 & 2 & 34 & 49 \\ 0 & 2 & 43 & 94 \\ 0 & 0 & -2 & 104 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

(GATE - 02[CS])

- (a) 1,2,-2,-1
- (b) -1,-2,-1,-2
- (c) 1,2,2,1
- (d) None

Use the code : BVREDDY, to get the maximum discount

84. The number of linearly independent eigen

vectors of $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ is

(GATE-07[ME])

- (a) 0
- (b) 1
- (c) 2
- (d) infinite

Use the code : BVREDDY, to get the maximum discount

85. The determinant of the matrix

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 100 & 1 & 0 & 0 \\ 100 & 200 & 1 & 0 \\ 100 & 200 & 300 & 1 \end{bmatrix} \text{ is } (\text{GATE - 02[EE]})$$

- (a) 100
- (b) 200
- (c) 1
- (d) 300

Use the code : BVREDDY, to get the maximum discount

86. Eigen values of the following matrix are

$$\begin{bmatrix} -1 & 4 \\ 4 & -1 \end{bmatrix}$$

(GATE – 02|CE)

- (a) 3, -5
- (b) -3, 5
- (c) -3, -5
- (d) 3, 5

Use the code : BVREDDY, to get the maximum discount

87. If matrix $X = \begin{bmatrix} a & 1 \\ -a^2 + a - 1 & 1-a \end{bmatrix}$ and
 $X^2 - X + I = O$ then the inverse of X is
(GATE – 04)

(a) $\begin{bmatrix} 1-a & -1 \\ a^2 & a \end{bmatrix}$

(b) $\begin{bmatrix} 1-a & -1 \\ a^2 - a + 1 & a \end{bmatrix}$

(c) $\begin{bmatrix} -a & 1 \\ -a^2 + a - 1 & a - 1 \end{bmatrix}$

(d) $\begin{bmatrix} a^2 - a + 1 & a \\ 1 & 1-a \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

88. The number of different $n \times n$ symmetric matrices with each elements being either 0 or 1 is

(GATE-04[CS])

(a) 2^n

(c) $2^{\frac{n^2+n}{2}}$

(b) 2^{n^2}

(d) $2^{\frac{n^2-n}{2}}$

Use the code : BVREDDY, to get the maximum discount

89. Let A, B, C, D be $n \times n$ matrices, each with non-zero determinant. $ABCD = I$ then $B^{-1} =$

(GATE-04[CS])

- (a) $D^{-1}C^{-1}A^{-1}$
- (b) CDA
- (c) ABC
- (d) does not exist

Use the code : BVREDDY, to get the maximum discount

90. The sum of the eigen values of the matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

is **(GATE-04[ME])**

- (a) 5
- (b) 7
- (c) 9
- (d) 18

Use the code : BVREDDY, to get the maximum discount

91. For what value of x will the matrix given

below become singular?

$$\begin{bmatrix} 8 & x & 0 \\ 4 & 0 & 2 \\ 12 & 6 & 0 \end{bmatrix}$$

(GATE-04[ME])

- a) -4
- b) 4
- c) 2
- d)-2

Use the code : BVREDDY, to get the maximum discount

92. Real matrices $[A]_{3 \times 1}$, $[B]_{3 \times 3}$, $[C]_{3 \times 5}$, $[D]_{5 \times 3}$, $[E]_{5 \times 5}$, $[F]_{5 \times 1}$ are given. Matrices $[B]$ and $[E]$ are symmetric. Following statements are made with respect to their matrices.

- (I) Matrix product $[F]^T [C]^T [B] [C] [F]$ is a scalar.
- (II) Matrix product $[D]^T [F] [D]$ is always symmetric.

With reference to above statements which of the following applies?

(GATE-04[CE])

- (a) statement (I) is true but (II) is false
- (b) statement (I) is false but (II) is true
- (c) both the statements are true
- (d) both the statements are false

Use the code : BVREDDY, to get the maximum discount

93. The eigen values of the matrix $\begin{bmatrix} 4 & -2 \\ -2 & 1 \end{bmatrix}$

are

(GATE-04[CE])

- (a) 1, 4
- (b) -1, 2
- (c) 0, 5
- (d) can not be determined

Use the code : BVREDDY, to get the maximum discount

94. What are the eigen values of the following

2 x 2 matrix $\begin{bmatrix} 2 & -1 \\ -4 & 5 \end{bmatrix}$ (GATE-05[CS])

- (a) -1, 1
- (b) 1, 6
- (c) 2, 5
- (d) 4, -1

Use the code : BVREDDY, to get the maximum discount

95. Consider the matrices $X_{4 \times 3}$, $Y_{4 \times 3}$ and $P_{2 \times 3}$.

The order of $[P (X^T Y)^{-1} P^T]^T$ will be

(GATE-05[CE])

- (a) 2×2
- (b) 3×3
- (c) 4×3
- (d) 3×4

Use the code : BVREDDY, to get the maximum discount

96. The determinant of the matrix given below

is
$$\begin{bmatrix} 0 & 1 & 0 & 2 \\ -1 & 1 & 1 & 3 \\ 0 & 0 & 0 & 1 \\ 1 & -2 & 0 & 1 \end{bmatrix}$$

(GATE-05)

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

Use the code : BVREDDY, to get the maximum discount

97. For the matrix $P = \begin{bmatrix} 3 & -2 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, one of the eigen values is -2. Which of the following is an eigen vector? (GATE-05[EE])

(a) $\begin{pmatrix} 3 \\ -2 \\ 1 \end{pmatrix}$

(b) $\begin{pmatrix} -3 \\ 2 \\ -1 \end{pmatrix}$

(c) $\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$

(d) $\begin{pmatrix} 2 \\ 5 \\ 0 \end{pmatrix}$

Use the code : BVREDDY, to get the maximum discount

98. If $R = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & -1 \\ 2 & 3 & 2 \end{bmatrix}$ then the top row of R^{-1}

is **(GATE-05[EE])**

- (a) [5 6 4] (b) [5 -3 1]
- (c) [2 0 -1] (d) [2 -1 0]

Use the code : BVREDDY, to get the maximum discount

99. The eigen values of the matrix M given are
15, 3 and 0.

$$M = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}, \text{the value of the determinant}$$

of a matrix is

(GATE-05[PI])

- (a) 20
- (b) 10
- (c) 0
- (d) -10

Use the code : BVREDDY, to get the maximum discount

100. Identify which one of the following is an

eigen vector of the matrix $A = \begin{bmatrix} 1 & 0 \\ -1 & -2 \end{bmatrix}$

(GATE-05[IN])

- (a) $[-1 \ 1]^T$
- (b) $[3 \ -1]^T$
- (c) $[1 \ -1]^T$
- (d) $[-2 \ 1]^T$

Use the code : BVREDDY, to get the maximum discount

101. If $A = \begin{bmatrix} 2 & -0.1 \\ 0 & 3 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} \frac{1}{2} & a \\ 0 & b \end{bmatrix}$ then

$$a + b =$$

(GATE-05[EE])

(a) $\frac{7}{20}$

(b) $\frac{3}{20}$

(c) $\frac{19}{60}$

(d) $\frac{11}{20}$

Use the code : BVREDDY, to get the maximum discount

102. Given an orthogonal matrix

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{bmatrix}. (AA^T)^{-1} \text{ is}$$

(GATE-05[EC])

- (a) $\frac{1}{4}I_4$
- (b) $\frac{1}{2}I_4$
- (c) I
- (d) $\frac{1}{3}I_4$

Use the code : BVREDDY, to get the maximum discount

103. Given the matrix $\begin{bmatrix} -4 & 2 \\ 4 & 3 \end{bmatrix}$, the eigen vector

is

(GATE-05[EC])

(a) $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$

(b) $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$

(c) $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$

(d) $\begin{bmatrix} -2 \\ 1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

104. Eigen values of a matrix $S = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ are

5 and 1. What are the eigen values of the matrix $S^2 = SS$? **(GATE - 06[ME])**

- (a) 1 and 25
- (b) 6, 4
- (c) 5, 1
- (d) 2, 10

Use the code : BVREDDY, to get the maximum discount

105. Multiplication of matrices E and F is G.

Matrices E and G are

$$E = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \text{ and } G = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

What is the matrix F?

(GATE-06[ME])

(a) $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} \cos\theta & \cos\theta & 0 \\ -\cos\theta & \sin\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} \sin\theta & -\cos\theta & 0 \\ \cos\theta & \sin\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

106. For a given 2×2 matrix A, it is observed that

$$A \begin{bmatrix} 1 \\ -1 \end{bmatrix} = -1 \begin{bmatrix} 1 \\ -1 \end{bmatrix} \text{ and } A \begin{bmatrix} 1 \\ -2 \end{bmatrix} = -2 \begin{bmatrix} 1 \\ -2 \end{bmatrix}$$

then the matrix A is (GATE-06[IN])

(a) $A = \begin{bmatrix} 2 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ -1 & -2 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1 & 1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ -1 & -1 \end{bmatrix}$

(c) $A = \begin{bmatrix} 1 & 1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ -1 & -1 \end{bmatrix}$

(d) $A = \begin{bmatrix} 0 & -2 \\ 1 & -3 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

107. The eigen values and the corresponding eigen vectors of a 2×2 matrix are given by

Eigen value

$$\lambda_1 = 8$$

Eigen vector

$$V_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$\lambda_2 = 4$$

$$V_2 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

The matrix is

(GATE-06[EC])

(a) $\begin{bmatrix} 6 & 2 \\ 2 & 6 \end{bmatrix}$

(b) $\begin{bmatrix} 4 & 6 \\ 6 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 4 \\ 4 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} 4 & 8 \\ 8 & 4 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

108. For the matrix $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$. The eigen value

corresponding to the eigen vector $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ is

(GATE-06[EC])

- (a) 2
- (b) 4
- (c) 6
- (d) 8

Use the code : BVREDDY, to get the maximum discount

109. For a given matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ -2 & -1 & 6 \\ 1 & 2 & 0 \end{bmatrix}$, one

of the eigen value is 3. The other two eigen values are

(GATE-06[CE])

- (a) 2, -5
- (b) 3, -5
- (c) 2, 5
- (d) 3, 5

Use the code : BVREDDY, to get the maximum discount

110. The minimum and maximum eigen values

of matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are -2 and 6

respectively. What is the other eigen value?

(GATE-07[CE])

- (a) 5
- (b) 3
- (c) 1
- (d) -1

Use the code : BVREDDY, to get the maximum discount

111. The inverse of 2×2 matrix $\begin{bmatrix} 1 & 2 \\ 5 & 7 \end{bmatrix}$ is

(GATE - 07[CE])

(a) $\frac{1}{3} \begin{bmatrix} -7 & 2 \\ 5 & -1 \end{bmatrix}$

(b) $\frac{1}{3} \begin{bmatrix} 7 & 2 \\ 5 & 1 \end{bmatrix}$

(c) $\frac{1}{3} \begin{bmatrix} 7 & -2 \\ -5 & 1 \end{bmatrix}$

(d) $\frac{1}{3} \begin{bmatrix} -7 & -2 \\ -5 & -1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

112. If a square matrix A is real and symmetric
then the eigen values

(GATE – 07[ME])

- (a) are always real
- (b) are always real and positive
- (c) are always real and non-negative
- (d) occur in complex conjugate pairs

Use the code : BVREDDY, to get the maximum discount

113. The determinant $\begin{vmatrix} 1+b & b & 1 \\ b & 1+b & 1 \\ 1 & 2b & 1 \end{vmatrix}$ equals to
(GATE-07[PI])

- (a) 0
- (b) $2b(b - 1)$
- (c) $2(1 - b)(1 + 2b)$
- (d) $3b(1 + b)$

Use the code : BVREDDY, to get the maximum discount

114. If $A = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix}$ then A^9 equals

(GATE-07[EE])

- (a) $511 A + 510 I$
- (b) $309 A + 104 I$
- (c) $154 A + 155 I$
- (d) e^{9A}

Use the code : BVREDDY, to get the maximum discount

115. All the four entries of 2×2 matrix

$P = \begin{bmatrix} P_{11} & P_{12} \\ P_{21} & P_{22} \end{bmatrix}$ are non - zero and one of

the eigen values is zero. Which of the following statement is true?

(GATE-08[EC])

- (a) $P_{11}P_{22} - P_{12}P_{21} = 1$
- (b) $P_{11}P_{22} - P_{12}P_{21} = -1$
- (c) $P_{11}P_{22} - P_{21}P_{12} = 0$
- (d) $P_{11}P_{22} + P_{12}P_{21} = 0$

Use the code : BVREDDY, to get the maximum discount

116. The matrix $\begin{bmatrix} 1 & 2 & 4 \\ 3 & 0 & 6 \\ 1 & 1 & p \end{bmatrix}$ has one eigen value to 3. The sum of the other two eigen values is

(GATE-08[ME])

- (a) p
- (b) p - 1
- (c) p - 2
- (d) p - 3

Use the code : BVREDDY, to get the maximum discount

117. The eigen vectors of the matrix $\begin{bmatrix} 1 & 2 \\ 0 & 2 \end{bmatrix}$ are

written in the form $\begin{bmatrix} 1 \\ a \end{bmatrix}$ & $\begin{bmatrix} 1 \\ b \end{bmatrix}$. What is

$a + b$?

(GATE-08[ME])

- (a) 0
- (b) $\frac{1}{2}$
- (c) 1
- (d) 2

Use the code : BVREDDY, to get the maximum discount

118. The eigen vector pair of the matrix

$$\begin{bmatrix} 3 & 4 \\ 4 & -3 \end{bmatrix}$$
 is

(GATE-08[PI])

(a) $\begin{bmatrix} 2 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

(b) $\begin{bmatrix} 2 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

(c) $\begin{bmatrix} -2 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

(d) $\begin{bmatrix} -2 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

119. The inverse of matrix $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(GATE-08[PI])

(a) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & -1 \\ -1 & 0 & 0 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

120. How many of the following matrices have an eigen value 1?

$$\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \text{ & } \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

(GATE-08[CS])

- (a) one
- (b) two
- (c) three
- (d) four

Use the code : BVREDDY, to get the maximum discount

121 . The product of matrices $(PQ)^{-1} P$ is

(GATE-08[CE])

- (a) P^{-1}
- (b) Q^{-1}
- (c) $P^{-1} Q^{-1} P$
- (d) $P Q P^{-1}$

Use the code : BVREDDY, to get the maximum discount

122. The eigen values of the matrix

$$[P] = \begin{bmatrix} 4 & 5 \\ 2 & -5 \end{bmatrix} \text{ are } \quad (\text{GATE-08[CE]})$$

- (a) -7 and 8
- (b) -6 and 5
- (c) 3 and 4
- (d) 1 and 2

Use the code : BVREDDY, to get the maximum discount

123. A square matrix B is symmetric if _____
(GATE-09[CE])

- (a) $B^T = -B$
- (b) $B^T = B$
- (c) $B^{-1} = B$
- (d) $B^{-1} = B^T$

Use the code : BVREDDY, to get the maximum discount

124. The eigen values of the following matrix

$$\begin{bmatrix} -1 & 3 & 5 \\ -3 & -1 & 6 \\ 0 & 0 & 3 \end{bmatrix} \text{ are } \quad (\text{GATE-09[EC]})$$

- (a) 3, 3+5j, 6-j
- (b) -6+5j, 3+j, 3-j
- (c) 3+j, 3-j, 5+j
- (d) 3, -1+3j, -1-3j

Use the code : BVREDDY, to get the maximum discount

125. The characteristic equation of a 3×3 matrix P is defined as

$$\alpha(\lambda) = |\lambda I - P| = \lambda^3 + 2\lambda + \lambda^2 + 1 = 0.$$

If I denotes identity matrix then the inverse of P will be

(GATE-08[EE])

- | | |
|-----------------------|------------------------|
| (a) $P^2 + P + 2I$ | (b) $P^2 + P + I$ |
| (c) $- (P^2 + P + I)$ | (d) $- (P^2 + P + 2I)$ |

Use the code : BVREDDY, to get the maximum discount

126. The eigen values of a 2×2 matrix X are -2 and -3. The eigen values of matrix $(X+I)^{-1}(X+5I)$ are **(GATE-09[IN])**

Use the code : **BVREDDY**, to get the maximum discount

127.

For a matrix $[M] = \begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ \frac{5}{5} & \frac{5}{5} \\ x & \frac{3}{5} \end{bmatrix}$. The

transpose of the matrix is equal to the inverse of the matrix, $[M]^T = [M]^{-1}$. The value of x is given by (GATE-09[ME])

(a) $-\frac{4}{5}$

(b) $-\frac{3}{5}$

(c) $\frac{3}{5}$

(d) $\frac{4}{5}$

Use the code : BVREDDY, to get the maximum discount

128. The trace and determinant of a 2×2 matrix are shown to be -2 and -35 respectively. Its eigen values are

(GATE-09[EE])

- (a) $-30, -5$
- (b) $-37, -1$
- (c) $-7, 5$
- (d) $17.5, -2$

Use the code : BVREDDY, to get the maximum discount

129. The value of the determinant

$$\begin{vmatrix} 1 & 3 & 2 \\ 4 & 1 & 1 \\ 2 & 1 & 3 \end{vmatrix}$$

(GATE-09[PI])

is

- (a) - 28
- (b) - 24
- (c) 32
- (d) 36

Use the code : BVREDDY, to get the maximum discount

130. An eigen vector of $p = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ is

(GATE-10[EE])

- (a) $[-1 \ 1 \ 1]^T$
- (b) $[1 \ 2 \ 1]^T$
- (c) $[1 \ -1 \ 2]^T$
- (d) $[2 \ 1 \ -1]^T$

Use the code : BVREDDY, to get the maximum discount

131. The eigen values of a skew-symmetric matrix are **(GATE-10[EC])**

- (a) always zero
- (b) always pure imaginary
- (c) either zero (or) pure imaginary
- (d) always real

Use the code : BVREDDY, to get the maximum discount

132. One of the eigen vector of the matrix

$$A = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix} \text{ is } \quad (\text{GATE-10[ME]})$$

(a) $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$

(b) $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$

(c) $\begin{bmatrix} 4 \\ 1 \end{bmatrix}$

(d) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

133. A real $n \times n$ matrix $A = [a_{ij}]$ is defined as

follows $\begin{cases} a_{ij} = i, & \forall i = j \\ = 0, & \text{otherwise} \end{cases}$.

The sum of all n eigen values of A is

(GATE 10[IN])

(a) $\frac{n(n+1)}{2}$

(b) $\frac{n(n-1)}{2}$

(c) $\frac{n(n+1)(2n+1)}{2}$

(d) n^2

Use the code : BVREDDY, to get the maximum discount

134. X and Y are non-zero square matrices of size $n \times n$. If $XY = O_{n \times n}$ then

(GATE-10[IN])

- (a) $|X| = 0$ and $|Y| \neq 0$
- (b) $|X| \neq 0$ and $|Y| = 0$
- (c) $|X| = 0$ and $|Y| = 0$
- (d) $|X| \neq 0$ and $|Y| \neq 0$

Use the code : BVREDDY, to get the maximum discount

135. Consider the following matrix $A = \begin{bmatrix} 2 & 3 \\ x & y \end{bmatrix}$.

If the eigen values of A are 4 and 8 then

(GATE-10[CS])

- (a) $x = 4, y = 10$
- (b) $x = 5, y = 8$
- (c) $x = -3, y = 9$
- (d) $x = -4, y = 10$

Use the code : BVREDDY, to get the maximum discount

136. The inverse of the matrix $\begin{bmatrix} 3+2i & i \\ -i & 3-2i \end{bmatrix}$ is
(GATE-10[CE])

- (a) $\frac{1}{2} \begin{bmatrix} 3+2i & -i \\ i & 3-2i \end{bmatrix}$
- (b) $\frac{1}{12} \begin{bmatrix} 3-2i & -i \\ i & 3+2i \end{bmatrix}$
- (c) $\frac{1}{14} \begin{bmatrix} 3+2i & -i \\ i & 3-2i \end{bmatrix}$
- (d) $\frac{1}{14} \begin{bmatrix} 3-2i & -i \\ i & 3+2i \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

137. If $(1, 0, -1)^T$ is an eigen vector of the

following matrix $\begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 1 \end{bmatrix}$ then the

corresponding eigen value is

(GATE-10[PI])

- (a) 1
- (b) 2
- (c) 3
- (d) 5

Use the code : BVREDDY, to get the maximum discount

138. The minimum eigenvalue of the following

matrix is $\begin{bmatrix} 3 & 5 & 2 \\ 5 & 12 & 7 \\ 2 & 7 & 5 \end{bmatrix}$

(GATE – 13[EC])

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

Use the code : BVREDDY, to get the maximum discount

139. The matrix $[A] = \begin{bmatrix} 2 & 1 \\ 4 & -1 \end{bmatrix}$ is decomposed into a product of lower triangular matrix $[L]$ and an upper triangular $[U]$. The properly decomposed $[L]$ and $[U]$ matrices respectively are

(GATE-11[EE])

(a) $\begin{bmatrix} 1 & 0 \\ 4 & -1 \end{bmatrix}$ and $\begin{bmatrix} 1 & 1 \\ 0 & -2 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ and $\begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 \\ 4 & 1 \end{bmatrix}$ and $\begin{bmatrix} 2 & 1 \\ 0 & -1 \end{bmatrix}$

(d) $\begin{bmatrix} 2 & 0 \\ 4 & -3 \end{bmatrix}$ and $\begin{bmatrix} 1 & 0.5 \\ 0 & 1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

140. The matrix $M = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & 6 \\ -1 & -2 & 0 \end{bmatrix}$ has eigen

values $-3, -3, 5$. An eigen vector corresponding to the eigen value 5 is $[1 \ 2 \ -1]^T$. One of the eigen vector of the matrix M^3 is

(GATE-11[IN])

- (a) $[1 \ 8 \ -1]^T$
- (b) $[1 \ 2 \ -1]^T$
- (c) $[1 \ \sqrt[3]{2} \ -1]^T$
- (d) $[1 \ 1 \ -1]^T$

Use the code : BVREDDY, to get the maximum discount

141. The eigen values of the following matrix

Use the code : BVREDDY, to get the maximum discount

142. If a matrix $A = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$ and matrix

$B = \begin{bmatrix} 4 & 6 \\ 5 & 9 \end{bmatrix}$ the transpose of product of

these two matrices i.e., $(AB)^T$ is equal to

(GATE-11 [PI])

(a) $\begin{bmatrix} 28 & 19 \\ 34 & 47 \end{bmatrix}$

(b) $\begin{bmatrix} 19 & 34 \\ 47 & 28 \end{bmatrix}$

(c) $\begin{bmatrix} 48 & 33 \\ 28 & 19 \end{bmatrix}$

(d) $\begin{bmatrix} 28 & 19 \\ 48 & 33 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

143. Eigen values of a real symmetric matrix are

always

(GATE-11[ME])

(a) positive

(b) negative

(c) real

(d) 162. [A] is a square

Use the code : BVREDDY, to get the maximum discount

144. [A] is a square matrix which is neither symmetric nor skew-symmetric and $[A]^T$ is its transpose. The sum and differences of these matrices are defined as

$[S] = [A] + [A]^T$ and $[D] = [A] - [A]^T$ respectively. Which of the following statements is true? **(GATE-11[CS])**

- (a) Both [S] and [D] are symmetric
- (b) Both [S] and [D] are skew-symmetric
- (c) [S] is skew-symmetric and [D] is symmetric
- (d) [S] is symmetric and [D] is skew-symmetric

Use the code : BVREDDY, to get the maximum discount

145. Consider the matrix as given below

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 7 \\ 0 & 0 & 3 \end{bmatrix}$$

. Which one of the following options provides the correct values of the eigen values of the matrix? (GATE-11[CS])

- (a) 1, 4, 3
- (b) 3, 7, 3
- (c) 7, 3, 2
- (d) 1, 2, 3

Use the code : BVREDDY, to get the maximum discount

146. Given that $A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$,

the value of A^3 is

(GATE-12[EC, EE, IN])

- (a) $15A + 12I$
- (b) $19A + 30I$
- (c) $17A + 15I$
- (d) $17A + 21I$

Use the code : BVREDDY, to get the maximum discount

147. For the matrix $A = \begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$, ONE of the normalized eigen vectors is given as

(GATE-12[ME, PI])

(a) $\begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{\sqrt{3}}{2} \end{pmatrix}$

(b) $\begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{-1}{\sqrt{2}} \end{pmatrix}$

(c) $\begin{pmatrix} \frac{3}{\sqrt{10}} \\ \frac{-1}{\sqrt{10}} \end{pmatrix}$

(d) $\begin{pmatrix} \frac{1}{\sqrt{5}} \\ \frac{5}{2} \end{pmatrix}$

Use the code : BVREDDY, to get the maximum discount

148. The eigen values of matrix $\begin{bmatrix} 9 & 5 \\ 5 & 8 \end{bmatrix}$ are

(GATE-12[CE])

- (a) -2.42 and 6.86
- (b) 3.48 and 13.53
- (c) 4.70 and 6.86
- (d) 6.86 and 9.50

Use the code : BVREDDY, to get the maximum discount

149. A matrix has eigen values -1 and -2.

The corresponding eigenvectors are $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

and $\begin{bmatrix} 1 \\ -2 \end{bmatrix}$ respectively. The matrix is

(GATE – 13[EE])

(a) $\begin{bmatrix} 1 & 1 \\ -1 & -2 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 2 \\ -2 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

150. The two vectors $[1 \ 1 \ 1]$ and $[1 \ a \ a^2]$

where $a = -\frac{1}{2} + j\frac{\sqrt{3}}{2}$ and $j = \sqrt{-1}$ are

(GATE-11[EE])

- (a) orthonormal
- (b) orthogonal
- (c) parallel
- (d) collinear

Use the code : BVREDDY, to get the maximum discount

151. Let A be an $m \times n$ matrix and B an $n \times m$ matrix. It is given that determinant $(I_m + AB) = \text{determinant}(I_n + BA)$, where I_k is the $k \times k$ identity matrix. Using the above property, the determinant of the matrix

given below is

$$\begin{bmatrix} 2 & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 \\ 1 & 1 & 2 & 1 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$

(GATE – 2013[EC])

- (a) 2
- (b) 5
- (c) 8
- (d) 16

Use the code : BVREDDY, to get the maximum discount

152. One pair of eigenvectors corresponding to the two eigen values of the matrix

$$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$
 is

(GATE – 2013[IN])

- (a) $\begin{bmatrix} 1 \\ -j \end{bmatrix}, \begin{bmatrix} j \\ -1 \end{bmatrix}$
- (b) $\begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \end{bmatrix}$
- (c) $\begin{bmatrix} 1 \\ j \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}$
- (d) $\begin{bmatrix} 1 \\ j \end{bmatrix}, \begin{bmatrix} j \\ 1 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

153. The eigen values of a symmetric matrix are

all (GATE – 2013 [ME])

- (a) Complex with non-zero positive imaginary part.
 - (b) Complex with non-zero negative imaginary part.
 - (c) real
 - (d) Pure imaginary

Use the code : **BVREDDY**, to get the maximum discount

154. What is the minimum number of multiplications involved in computing the matrix product PQR? Matrix P has 4 rows and 2 columns, matrix Q has 2 rows and 4 columns and matrix R has 4 rows and 1 column _____.

(GATE – 2013[CE])

Use the code : BVREDDY, to get the maximum discount

155. Which one of the following does NOT

equal $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$?

(GATE – 2013[CS])

(a) $\begin{vmatrix} 1 & x(x+1) & x+1 \\ 1 & y(y+1) & y+1 \\ 1 & z(z+1) & z+1 \end{vmatrix}$

(b) $\begin{vmatrix} 1 & x+1 & x^2+1 \\ 1 & y+1 & y^2+1 \\ 1 & z+1 & z^2+1 \end{vmatrix}$

(c) $\begin{vmatrix} 0 & x-y & x^2-y^2 \\ 0 & y-z & y^2-z^2 \\ 1 & z & z^2 \end{vmatrix}$

(d) $\begin{vmatrix} 2 & x+y & x^2+y^2 \\ 2 & y+z & y^2+z^2 \\ 1 & z & z^2 \end{vmatrix}$

Use the code : BVREDDY, to get the maximum discount

156. For matrices of same dimension M, N and scalar c, which one of these properties DOES NOT ALWAYS hold?

(GATE-14-EC-SET1)

- (a) $(M^T)^T = M$
- (b) $(cM)^T = c(M)^T$
- (c) $(M + N)^T = M^T + N^T$
- (d) $MN = NM$

Use the code : BVREDDY, to get the maximum discount

157. A real (4×4) matrix A satisfies the equation $A^2 = I$, where I is the (4×4) identity matrix. The positive eigen value of A is _____.

(GATE-14-EC-SET1)

Use the code : BVREDDY, to get the maximum discount

158. Consider the matrix

$$J_6 = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Which is obtained by reversing the order of the columns of the identity matrix I_6 . Let

$P = I_6 + \alpha J_6$, where α is a non-negative real number. The value of α for which $\det(P) = 0$ is _____.

(GATE-14-EC-SETI)

Use the code : BVREDDY, to get the maximum discount

159. The determinant of matrix A is 5 and the determinant of matrix B is 40. The determinant of matrix AB is _____.

(GATE-14-EC-SET2)

Use the code : BVREDDY, to get the maximum discount

160. The maximum value of the determinant among all 2×2 real symmetric matrices with trace 14 is _____.

(GATE-14-EC-SET2)

Use the code : BVREDDY, to get the maximum discount

161. Which one of the following statements is NOT true for a square matrix A?

(GATE-14-EC-SET3)

- (a) If A is upper triangular, the eigen values of A are the diagonal elements of it
- (b) If A is real symmetric, the eigen values of A are always real and positive
- (c) If A is real, the eigen values of A and A^T are always the same
- (d) If all the principal minors of A are positive, all the eigen values of A are also positive

Use the code : BVREDDY, to get the maximum discount

162. A system matrix is given as follows

$$A = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix}.$$

The absolute value of the ratio of the maximum eigen value to the minimum eigen value is _____.

(GATE-14-EE-SET1)

Use the code : BVREDDY, to get the maximum discount

163. Which one of the following statements is true for all real symmetric matrices?

(GATE-14-EE-SET2)

- (a) All the eigen values are real
- (b) All the eigen values are positive
- (c) All the eigen values are distinct
- (d) Sum of all the eigen values is zero

Use the code : BVREDDY, to get the maximum discount

164. A scalar valued function is defined as
 $f(x) = x^T Ax + b^T x + c$, where A is a symmetric positive definite matrix with dimension $n \times n$; b and x are vectors of dimension $n \times 1$. The minimum value of $f(x)$ will occur when x equals.

(GATE-14-IN-SET1)

- (a) $(A^T A)^{-1} B$
- (b) $-(A^T A)^{-1} B$
- (c) $-\left(\frac{A^{-1} B}{2}\right)$
- (d) $\frac{A^{-1} B}{2}$

Use the code : BVREDDY, to get the maximum discount

165. For the matrix A satisfying the equation given below, the eigen values are

$$[A] \begin{bmatrix} 1 & 2 & 3 \\ 7 & 8 & 9 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

(GATE-14-IN-SET1)

- (a) (1, -j, j)
- (b) (1, 1, 0)
- (c) (1, 1, -1)
- (d) (1, 0, 0)

Use the code : BVREDDY, to get the maximum discount

166. Given that the determinant of the matrix

$$\begin{bmatrix} 1 & 3 & 0 \\ 2 & 6 & 4 \\ -1 & 0 & 2 \end{bmatrix}$$

is -12 , the determinant of the

matrix $\begin{bmatrix} 2 & 6 & 0 \\ 4 & 12 & 8 \\ -2 & 0 & 4 \end{bmatrix}$ is (GATE-14-ME-SET1)

- (a) -96
- (b) -24
- (c) 24
- (d) 96

Use the code : BVREDDY, to get the maximum discount

167. One of the eigen vectors of the matrix

$$\begin{bmatrix} -5 & 2 \\ -9 & 6 \end{bmatrix}$$
 is

(GATE-14-ME-SET2)

(a) $\begin{Bmatrix} -1 \\ 1 \end{Bmatrix}$

(b) $\begin{Bmatrix} -2 \\ 9 \end{Bmatrix}$

(c) $\begin{Bmatrix} 2 \\ -1 \end{Bmatrix}$

(d) $\begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$

Use the code : BVREDDY, to get the maximum discount

168. Consider a 3×3 real symmetric matrix S such that two of its eigen values are $a \neq 0$, $b \neq 0$ with respective eigen vectors

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}, \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}. \text{ If } a \neq b \text{ then } x_1y_1 + x_2y_2 + x_3y_3$$

equals

(GATE-14-ME-SET3)

- (a) a
- (b) b
- (c) ab
- (d) 0

Use the code : BVREDDY, to get the maximum discount

169. Which one of the following equations is a correct identity for arbitrary 3×3 real matrices P, Q and R?

(GATE-14-ME-SET4)

- (a) $P(Q + R) = PQ + RP$
- (b) $(P - Q)^2 = P^2 - 2PQ + Q^2$
- (c) $\det(P + Q) = \det P + \det Q$
- (d) $(P + Q)^2 = P^2 + PQ + QP + Q^2$

Use the code : BVREDDY, to get the maximum discount

170.

Given the matrices $J = \begin{bmatrix} 3 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 6 \end{bmatrix}$ and

$K = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$, the product $K^T J K$ is _____.

(GATE-14-CE-SET1)

Use the code : BVREDDY, to get the maximum discount

171. The sum of Eigen values of the matrix, [M]

is where $[M] = \begin{bmatrix} 215 & 650 & 795 \\ 655 & 150 & 835 \\ 485 & 355 & 550 \end{bmatrix}$

(GATE-14-CE-SET1)

- (a) 915
- (b) 1355
- (c) 1640
- (d) 2180

Use the code : BVREDDY, to get the maximum discount

172. The determinant of matrix $\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 0 \\ 2 & 3 & 0 & 1 \\ 3 & 0 & 1 & 2 \end{bmatrix}$ is
(GATE-14-CE-SET2)

Use the code : BVREDDY, to get the maximum discount

173. The value of the dot product of the eigenvectors corresponding to any pair of different eigen values of a 4×4 symmetric positive definite matrix is _____.

(GATE-14-CS-SET1)

→ The Eigen vectors of the Symmetric matrix are orthogonal to each other.

$$x_1 \quad x_2 \quad x_3 \quad x_4$$

$$x_1 x_2^T = 0 \quad x_2 x_3^T = 0 \quad x_3 x_4^T = 0 \quad x_4 x_1^T = 0$$

Use the code : BVREDDY, to get the maximum discount

174. The product of the non-zero eigen values of

the matrix $\begin{bmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$ is _____.

(GATE-14-CS-SET2)

$$\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 = 5$$

$$Ax = \lambda x$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \lambda \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix}$$

$$x_1 + x_5 = \lambda x_1$$

$$x_2 + x_3 + x_4 = \lambda x_2$$

$$x_2 + x_3 + x_4 = \lambda x_3$$

$$x_2 + x_3 + x_4 = \lambda x_4$$

$$x_1 + x_5 = \lambda x_5$$

$$2(x_1 + x_5) = \lambda(x_1 + x_5)$$

$$\lambda = 2$$

$$\lambda_1, \lambda_2 = 6$$

$$3(x_2 + x_3 + x_4) = \lambda(x_2 + x_3 + x_4)$$

$$\lambda = 3$$

Use the code : BVREDDY, to get the maximum discount

175. Which one of the following statements is TRUE about every $n \times n$ matrix with only real eigen values? (GATE-14-CS-SET3)

- (a) If the trace of the matrix is positive and the determinant is negative, at least one of its eigen values is negative.
- (b) If the trace of the matrix is positive, all its eigen values are positive.
- (c) If the determinant of the matrix is positive, all its eigen values are positive.
- (d) If the product of the trace and determinant of the matrix is positive, all its eigen values are positive.

$$\lambda_1 + \lambda_2 + \lambda_3 = \text{+ve}$$

$$\lambda_1 \lambda_2 \lambda_3 = \text{+ve.}$$

Use the code : BVREDDY, to get the maximum discount

176. The value of 'P' such that the vector $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ is an eigenvector of the matrix $Ax = \lambda x$

$$\begin{bmatrix} 4 & 1 & 2 \\ P & 2 & 1 \\ 14 & -4 & 10 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \lambda \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

is ____.

(GATE-15-EC-SET1)

$$4 + 2 + 6 = \lambda$$

$$\lambda = 12$$

$$P + 4 + 3 = (12)(2)$$

$$P = 24 - 7$$

$$P = 17$$

Use the code : BVREDDY, to get the maximum discount

177. The value of 'x' for which all the eigenvalues of the matrix given below are real is

$$\begin{bmatrix} 10 & 5+j & 4 \\ x & 20 & 2 \\ 4 & 2 & -10 \end{bmatrix}$$

(GATE-15-EC- SET2)

- (a) $5 + j$
- ~~(b) $5 - j$~~
- (c) $1 - 5j$
- (d) $1 + 5j$

Transposed conjugate

$$A^\theta = (A^*)^T = (A^T)^*$$

$$A^\theta = A$$

→ Eigen values of Hermitian matrix

are real.

$$A^* = \begin{bmatrix} 10 & 5-j & 4 \\ x^* & 20 & 2 \\ 4 & 2 & -10 \end{bmatrix} \quad (A^*)^T = \begin{bmatrix} 10 & x^* & 4 \\ 5-j & 20 & 2 \\ 4 & 2 & -10 \end{bmatrix}$$

Hermitian matrix.

Use the code : BVREDDY, to get the maximum discount

$$x^* = 5+j$$

$$x = 5-j$$

178. For $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, the determinant of $A^T A^{-1}$ is

$$A^{-1} = \frac{1}{1+\tan^2 x} \begin{bmatrix} 1 & -\tan x \\ \tan x & 1 \end{bmatrix}$$

(GATE-15-EC-SET3)

- (a) $\sec^2 x$
- (b) $\cos 4x$
- (c) 1
- (d) 0

$$A^T A^{-1} = \left[\frac{1}{\tan x} \right] \begin{bmatrix} 1 & -\tan x \\ \tan x & 1 \end{bmatrix} \left[\frac{1}{1+\tan^2 x} \right]$$

$$= \begin{bmatrix} 1-\tan^2 x & -\tan x - \tan x \\ \tan x + \tan x & -\tan^2 x + 1 \end{bmatrix} \frac{1}{1+\tan^2 x} =$$

Use the code : BVREDDY, to get the maximum discount

$$= \frac{1}{1 + \tan^2 x} \left[(-\tan^2 x)^2 + 4\tan^2 x \right]$$

$$= \frac{1}{1 + \tan^2 x} \cdot (1 + \tan^2 x) = 1.$$

$$(a-b)^2 + 4ab = (a+b)^2$$

$$\begin{aligned}|A^T A^{-1}| &= |A^T| \quad |A^{-1}| \\&= |A| \quad \frac{1}{|A|} = 1.\end{aligned}$$

179. If the sum of the diagonal elements of a 2×2 matrix is -6 , then the maximum possible value of determinant of the matrix is _____.

(GATE-15-EE-SET1)

$$\lambda_1 + \lambda_2 = -6$$

$$\frac{\lambda_1 + \lambda_2}{2} = -3.$$

$$\sqrt{\lambda_1 \lambda_2} \leq \frac{\lambda_1 + \lambda_2}{2}$$

$$\sqrt{\lambda_1 \lambda_2} \leq -3.$$

$$\lambda_1 \lambda_2 \leq 9$$

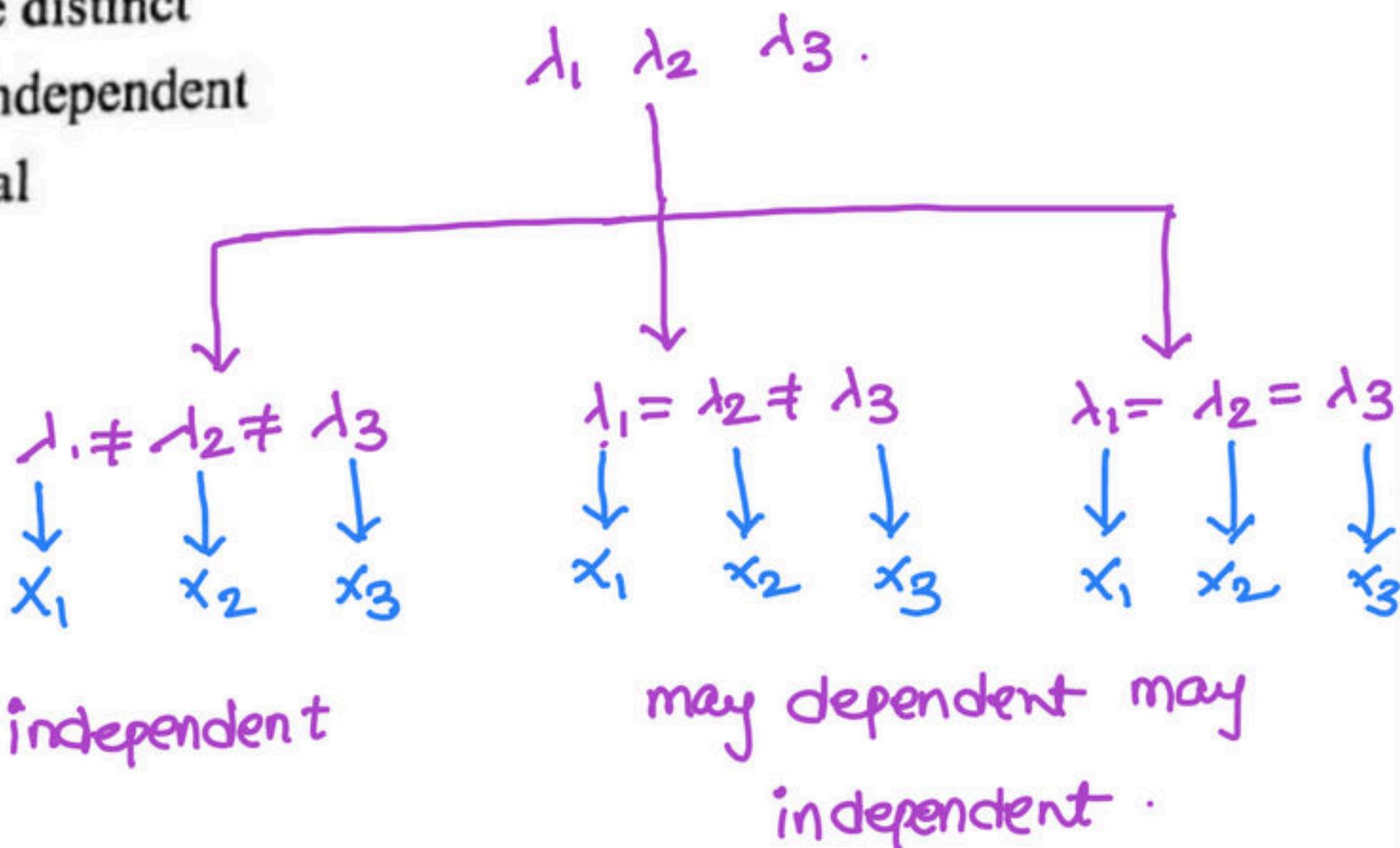
Use the code : BVREDDY, to get the maximum discount

180. The necessary condition to diagonalize a matrix is that

(GATE - 01[IN])

(A)_{3x3}.

- (a) all its eigen values should be distinct
- (b) its eigen vectors should be independent
- (c) its eigen values should be real
- (d) the matrix is non-singular



Use the code : BVREDDY, to get the maximum discount

181. The smallest and largest Eigen values of the

following matrix are:

$$\begin{bmatrix} 3 & -2 & 2 \\ 4 & -4 & 6 \\ 2 & -3 & 5 \end{bmatrix}$$

$$\lambda_1 + \lambda_2 + \lambda_3 = 4$$

$$\lambda_1 \lambda_2 \lambda_3 = 2.$$

(GATE – 15 – CE – Set 1)

- (a) 1.5 and 2.5
- (b) 0.5 and 2.5
- (c) 1.0 and 3.0
- (d) 1.0 and 2.0

$$\lambda_1 = 1$$

$$\lambda_2 = 1$$

$$\lambda_3 = 2.$$

Use the code : BVREDDY, to get the maximum discount

182. The two Eigen Values of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & p \end{bmatrix}$

have a ratio of 3:1 for $p = 2$. What is another value of 'p' for which the Eigen values have the same ratio of 3:1?

(GATE - 15 - CE - Set 2)

- (a) -2
- (b) 1
- (c) 7/3
- (d) ~~14/3~~

$$\lambda_1 + \lambda_2 = p+2$$

$$\lambda_1 \lambda_2 = 2p-1.$$

$$\frac{\lambda_1}{\lambda_2} = 3.$$

$$\lambda_1 = 3\lambda_2$$

$$4\lambda_2 = p+2$$

$$\lambda_2 = \frac{p+2}{4}$$

$$3p^2 - 20p + 28 = 0$$

$$3\lambda_2^2 = 2p-1$$

$$3\left(\frac{p+2}{4}\right)^2 = 2p-1.$$

$$3(p^2 + 4p + 4) = 32p - 16$$

$$3p^2 + 12p + 12 = 32p - 16$$

Use the code : BVREDDY, to get the maximum discount

183. If any two columns of a determinant

$$P = \begin{vmatrix} 4 & 7 & 8 \\ 3 & 1 & 5 \\ 9 & 6 & 2 \end{vmatrix}$$

are interchanged, which one

of the following statements regarding the value of the determinant is CORRECT?

(GATE – 15 – ME – Set 1)

- (a) Absolute value remains unchanged but
sign will change.
- (b) Both absolute value and sign will
change.
- (c) Absolute value will change but sign will
not change.
- (d) Both absolute value and sign will
remain unchanged.

Use the code : BVREDDY, to get the maximum discount

184. At least one eigenvalue of a singular matrix
is

(GATE - 15 - ME - Set 2)

- (a) positive
- (b) zero
- (c) negative
- (d) imaginary

$$|A| = 0$$

$$\lambda_1 \lambda_2 \lambda_3 = 0$$

Use the code : BVREDDY, to get the maximum discount

185. The lowest eigen value of the 2×2 matrix

$$\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix} \text{ is } \underline{\quad}. \text{(GATE - 15 - ME - Set 3)}$$

$$\lambda_1 + \lambda_2 = ?$$

$$\lambda_1 \lambda_2 = 12 \cdot 2 = 10$$

$$\lambda_1 = 5$$

$$\lambda_2 = 2$$

Use the code : BVREDDY, to get the maximum discount

186. For a given matrix $P = \begin{bmatrix} 4+3i & -i \\ i & 4-3i \end{bmatrix}$,

where $i = \sqrt{-1}$, the inverse of matrix P is

(GATE - 15 - ME - Set 3)

- (a) $\frac{1}{24} \begin{bmatrix} 4-3i & i \\ -i & 4+3i \end{bmatrix}$
- (b) $\frac{1}{25} \begin{bmatrix} i & 4-3i \\ 4+3i & -i \end{bmatrix}$
- (c) $\frac{1}{24} \begin{bmatrix} 4+3i & -i \\ i & 4-3i \end{bmatrix}$
- (d) $\frac{1}{25} \begin{bmatrix} 4+3i & -i \\ i & 4-3i \end{bmatrix}$

$$\begin{aligned} P^{-1} &= \frac{1}{16+9-1} \begin{bmatrix} 4-3i & i \\ -i & 4+3i \end{bmatrix} \\ &= \frac{1}{24} \begin{bmatrix} 4-3i & i \\ -i & 4+3i \end{bmatrix} \end{aligned}$$

Use the code : BVREDDY, to get the maximum discount

187. Consider the following 2×2 matrix A where two elements are unknown and are marked by a and b. The eigenvalues of this matrix are -1 and 7. What are the values of a and b?

$$A = \begin{pmatrix} 1 & 4 \\ b & a \end{pmatrix} \quad (\text{GATE} - 15 - \text{CS} - \text{Set 1})$$

- (a) a = 6, b = 4
- (b) a = 4, b = 6
- (c) a = 3, b = 5
- (d) ~~a = 5, b = 3~~

$$\lambda_1 + \lambda_2 = 1 + a = 6$$

$$\lambda_1 \lambda_2 = a - 4b = -7$$

$$a = 5$$

$$b = 3.$$

Use the code : BVREDDY, to get the maximum discount

188. The larger of the two eigenvalues of the

matrix $\begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$ is ____.

(GATE - 15 - CS - Set 2)

$$\lambda_1 + \lambda_2 = 5$$

$$\lambda_1 \lambda_2 = 4 - 10 = -6$$

$$\lambda_1 = 6$$

$$\lambda_2 = -1$$

Use the code : BVREDDY, to get the maximum discount

189. Perform the following operations on the

matrix $\begin{bmatrix} 3 & 4 & 45 \\ 7 & 9 & 105 \\ 13 & 2 & 195 \end{bmatrix}$

$R_2 \rightarrow R_2 + R_3$.

$C_3 \rightarrow C_3 - C_1$.

(i) Add the third row to the second row

(ii) Subtract the third column from the first column.

The determinant of the resultant matrix is _____. (GATE - 15 - CS - Set 2)

$$R_i \rightarrow R_i + k R_j$$

$$C_i \rightarrow C_i + k C_j$$

$$\left| \begin{array}{ccc} 3 & 4 & 45 \\ 7 & 9 & 105 \\ 13 & 2 & 195 \end{array} \right| = 0$$

NO change of det.

Use the code : BVREDDY, to get the maximum discount

190. In the given matrix $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ 1 & 2 & 1 \end{bmatrix}$, one of the

eigen values is 1. The eigen vectors corresponding to the eigen value 1 are

(GATE – 15 – CS – Set 3)

- (a) $\{\alpha(4, 2, 1) | \alpha \neq 0, \alpha \in \mathbb{R}\}$
- ~~(b) $\{\alpha(-4, 2, 1) | \alpha \neq 0, \alpha \in \mathbb{R}\}$~~
- (c) $\{\alpha(\sqrt{2}, 0, 1) | \alpha \neq 0, \alpha \in \mathbb{R}\}$
- (d) $\{\alpha(-\sqrt{2}, 0, 1) | \alpha \neq 0, \alpha \in \mathbb{R}\}$

$$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = 1 \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$x_1 - x_2 + 2x_3 = x_1$$

$$x_2 = 2x_3.$$

$$x_2 = x_2$$

$$x_1 + 2x_2 + x_3 = x_3.$$

$$x_1 = -2x_2$$

?

$$x_2 = K, x_1 = -2K$$

$$x_3 = \frac{K}{2}.$$

Use the code : BVREDDY, to get the maximum discount

191. In matrix equation $[A]\{X\} = \{R\}$.

$$[A] = \begin{bmatrix} 4 & 8 & 4 \\ 8 & 16 & -4 \\ 4 & -4 & 15 \end{bmatrix}, \{X\} = \begin{Bmatrix} 2 \\ 1 \\ 4 \end{Bmatrix} \text{ and } \{R\} = \begin{Bmatrix} 32 \\ 16 \\ 64 \end{Bmatrix}$$

One of the eigen values of matrix [A] is

- (a) 16
- (b) 15
- (c) 4
- (d) 8

(GATE-19-ME)

$$R = \lambda X.$$

$$\lambda = 16$$

$$A X = \lambda X$$

Use the code : BVREDDY, to get the maximum discount

192. 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.

The determinant of B is _____ (up to 1 decimal place)

$$|A - \lambda I| = 0$$

$$\begin{vmatrix} 1-\lambda & 0 & 1 \\ -1 & 2-\lambda & 0 \\ 0 & 0 & -2-\lambda \end{vmatrix} = 0$$

(GATE-18-EC)

$$4 - \lambda^2 - 4\lambda + \lambda^3 = 0$$

$$\lambda^3 - \lambda^2 - 4\lambda + 4 = 0$$

$$A^3 - A^2 - 4A + 4I = 0$$

$$(1-\lambda)[-(2-\lambda)(2+\lambda)] + 0 + 1(0) = 0$$

$$A^3 - A^2 - 4A + 5I = I$$

$$B = I$$

$$|B| = 1$$

Use the code : BVREDDY, to get the maximum discount

193. Consider a matrix P whose only eigenvectors are the multiples of $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$

Consider the following statements.

- (I) P does not have an inverse $\cancel{\times}$
- (II) P has a repeated eigenvalue $\cancel{\checkmark}$
- (III) P cannot be diagonalized \checkmark

Which one of the following options is correct?

- (a) Only I and III are necessarily true
- (b) Only II is necessarily true
- (c) Only I and II are necessarily true
- (d) Only II and III are necessarily true \checkmark

$$x_1 = \begin{bmatrix} 1 \\ 4 \end{bmatrix} \quad x_2 = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

(GATE-18-CSIT)

Use the code : BVREDDY, to get the maximum discount

194. Let A be $n \times n$ real valued square symmetric matrix of rank 2 with $\sum_{i=1}^n \sum_{j=1}^n A_{ij}^2 = 50$. Consider the following statements.

- (I) One eigenvalue must be in $[-5, 5]$
(II) The eigenvalue with the largest magnitude must be strictly greater than 5

Which of the above statements about eigenvalues of A is/are necessarily *correct*?

- (a) Both (I) and (II)
(c) (II) only \times

- (b) (I) only ✓
(d) Neither (I) nor (II)

(GATE-17-CSIT)

$$A_{3 \times 3} = \begin{bmatrix} -5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{aligned} 5^2 + 5^2 &= 50 \\ p(A) &= 2 \end{aligned}$$

$$\lambda_1 = 5.$$

$$\lambda_2 = -5$$

Use the code : BVREDDY, to get the maximum discount

195. The matrix $A = \begin{bmatrix} \frac{3}{2} & 0 & \frac{1}{2} \\ 0 & -1 & 0 \\ \frac{1}{2} & 0 & \frac{3}{2} \end{bmatrix}$ has three distinct eigen values and one of its eigen vectors is $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$. Which one of the following can be another eigen vector of A?

$$A^T = A$$

Symmetric.

(a) $\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

(b) $\begin{bmatrix} -1 \\ 0 \\ 0 \end{bmatrix}$

(d) $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

(GATE-17-EE)

→ Eigen values of Symmetric matrix
are Real

→ Eigen vectors of Symmetric matrix
are orthogonal.

$x_1 x_2^T = 0$

Use the code : BVREDDY, to get the maximum discount

196. If the entries in each column of a square matrix M add up to 1, then an eigen value of M is

- (a) 4
(c) 2

- (b) 3
(d) 1

(GATE-16-CE)

$$M = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\lambda_1 = 1$$

$$\lambda_2 = 1$$

$$\lambda_3 = 1.$$

Use the code : BVREDDY, to get the maximum discount

197. Among the following, the pair of vectors orthogonal to each other is

(GATE – 95[ME])

- (a) [3, 4, 7], [3, 4, 7]
- (b) [1, 0, 0], [1, 1, 0]
- (c) [1, 0, 2], [0, 5, 0] (c)
- (d) [1, 1, 1], [-1, -1, -1]

$$x_1 x_2^T = 0 \rightarrow \text{orthogonal}$$

$$x_1 x_1^T = 1 \rightarrow \text{orthonormal}.$$

Use the code : BVREDDY, to get the maximum discount

198. Let $M^4 = I$ (where I denotes the identity matrix) and $M \neq I$, $M^2 \neq I$ and $M^3 \neq I$. Then, for any natural number k , M^{-1} equals:

(GATE - 16 - EC - Set 1)

- (a) M^{4k+1}
- (b) M^{4k+2}
- (c) ~~M^{4k+3}~~
- (d) M^{4k}

$$M^{-1} = M^{4k+3}.$$

$$\begin{array}{c|c|c} M^4 = I & M^8 = I & M^{12} = I \\ M^3 = M^{-1} & M^7 = M^{-1} & M^{11} = M^{-1} \end{array}$$

Use the code : BVREDDY, to get the maximum discount

199. Let $A_{n \times n}$ be matrix of order n and I_{12} be the matrix obtained by interchanging the first and second rows of I_n . Then $A I_{12}$ is such that its first. **(GATE - 97[CS])**

- (a) row is the same as its second row
- (b) row is the same as second row of A
- ~~(c) column is the same as the second column of A~~
- (d) row is a zero row.

$$A I_{12} = A \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Use the code : BVREDDY, to get the maximum discount

200. If the vector $\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$ is an eigen vector of

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix} \text{ then one of the eigen}$$

value of A is

- (a) 1
~~(c) 5~~

(GATE - 98[EE])

- (b) 2
(d) -1

$$Ax = \lambda x$$

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix} = \lambda \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$$-2 + 4 + 3 = \lambda$$

$$\lambda = 5$$

Use the code : BVREDDY, to get the maximum discount

201. If $A = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & -1 & 0 & -1 \\ 0 & 0 & i & i \\ 0 & 0 & 0 & -i \end{bmatrix}$ the matrix A^4 , UTM

$$\lambda = 1, -1, i, -i$$

calculated by the use of Cayley – Hamilton theorem **(GATE – 93)**

$$(\lambda - 1)(\lambda + i)(\lambda - i)(\lambda + i) = 0$$

$$(\lambda^2 - 1)(\lambda^2 + 1) = 0$$

$$\lambda^4 - 1 = 0$$

$$A^4 - I = 0$$

$$A^4 = I$$

Use the code : BVREDDY, to get the maximum discount

202. A 5×7 matrix has all its entries equal to 1.

Then the rank of a matrix is

(GATE – 94[EE])

- (a) 7
- (b) 5
- ~~(c) 1~~
- (d) Zero

Use the code : BVREDDY, to get the maximum discount

203. The rank of $(m \times n)$ matrix ($m < n$) cannot be more than

(GATE - 94[EC])

- (a) m
- (b) n
- (c) mn
- (d) None

Use the code : BVREDDY, to get the maximum discount

204. The rank of the matrix $\begin{bmatrix} 0 & 0 & -3 \\ 9 & 3 & 5 \\ 3 & 1 & 1 \end{bmatrix}$ is
(GATE - 94[CS])
- (a) 0
(b) 1
(c) 2
(d) 3

$$\begin{bmatrix} 3 & 1 & 1 \\ 9 & 3 & 5 \\ 0 & 0 & -3 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 3R_1$$

$$\begin{bmatrix} 3 & 1 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & -3 \end{bmatrix}$$

$$R_3 \rightarrow 2R_3 + 3R_2$$

$$\begin{bmatrix} 3 & 1 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{bmatrix}$$

Use the code : BVREDDY, to get the maximum discount

205. If for a matrix, rank equals both the number of rows and number of columns, then the matrix is called

(GATE - 94[PI])

- (a) Non-singular
- (b) singular
- (c) transpose
- (d) minor

$(A)_{n \times n}$

$$r(A) = n$$

$$|A| \neq 0$$

Use the code : BVREDDY, to get the maximum discount

206. Rank of the matrix $\begin{bmatrix} 0 & 2 & 2 \\ 7 & 4 & 8 \\ -7 & 0 & -4 \end{bmatrix}$ is 3 $= 0 - 2(-28 + 56) + 2(0 + 28)$
 $\underline{\underline{= 0}}$
 (GATE - 94[ME])

(a) True

(b) False

$$\text{P(A)} \neq 3$$

Use the code : BVREDDY, to get the maximum discount

207. The rank of the following $(n+1) \times (n+1)$ matrix, where 'a' is a real number is

$$\begin{bmatrix} 1 & a & a^2 & \dots & \dots & a^n \\ 1 & a & a^2 & \dots & \dots & a^n \\ \vdots & & & & & \\ \vdots & & & & & \\ 1 & a & a^2 & \dots & \dots & a^n \end{bmatrix}$$

(GATE - 95[EE])

- (a) 1 (b) 2
- (c) n (d) depends on the value of a

3×3

$$A = \begin{bmatrix} 1 & a & a^2 \\ 1 & a & a^2 \\ 1 & a & a^2 \end{bmatrix} \rightarrow R_2 \rightarrow R_3$$

$\ell(A) = 1$

Use the code : BVREDDY, to get the maximum discount

208. The rank of the matrix $\begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & 0 & 3 & 0 \\ 4 & 2 & 3 & 1 \\ 3 & 12 & 24 & 2 \end{bmatrix}$ is
(GATE - 98[CS])

- (a) 3
- (b) 1
- (c) 2
- ~~(d) 4~~

$$R_3 \rightarrow R_3 - 4R_1 \quad | \quad R_4 \rightarrow R_4 - 3R_1.$$

$$\begin{array}{cccc|c} 1 & 4 & 8 & 7 & \\ 0 & 0 & 3 & 0 & \\ 12 & 12 & 24 & 2 & \\ 24 & - & 2 & - & \end{array}$$

$$\begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & 0 & 3 & 0 \\ 0 & -14 & -24 & -27 \\ 0 & 0 & 0 & -19 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & -14 & -24 & -27 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & -19 \end{bmatrix}$$

UTM.

Use the code : BVREDDY, to get the maximum discount

209. Consider the following two statements.

(GATE-2000[CE])

- (I) The maximum number of linearly independent column vectors of a matrix A is called the rank of A .
 - (II) If A is $n \times n$ square matrix then it will be non-singular if rank of $A = n$
- (a) Both the statements are false
 - (b) Both the statements are true
 - (c) (I) is true but (II) is false
 - (d) (I) is false but (II) is true

Use the code : BVREDDY, to get the maximum discount

210. The rank of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$ is $\rightarrow R_1$
 $\rightarrow R_2$
 $\rightarrow R_3$.

$$R_3 = R_1 + R_2.$$

(GATE-2000[IN])

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

Use the code : BVREDDY, to get the maximum discount

211. The rank of the matrix $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ is

(GATE - 02[CS])

- (a) 4
- (b) 2
- (c) 1
- (d) 0

Use the code : BVREDDY, to get the maximum discount

212. Given matrix $[A] = \begin{bmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 1 \end{bmatrix}$, the rank

of the matrix is

- (a) 4
- (b) 3
- (c) 2
- (d) 1

(GATE - 03[CE])

$$\begin{bmatrix} 4 & 2 & 1 & 3 \\ 0 & 0 & 10 & 10 \\ 0 & 0 & -1 & -1 \end{bmatrix}$$

$R_2 \rightarrow 4R_2 - 6R_3$

$12 - 12$

$16 - 6$

$28 - 18$

$$R_3 \rightarrow 10R_3 + R_2$$

$$\begin{bmatrix} 4 & 2 & 1 & 3 \\ 0 & 0 & 10 & 10 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$R_3 \rightarrow 2R_3 - R_1$

$0 - 1$

$2 - 3$

Use the code : BVREDDY, to get the maximum discount

213. Let $A = [a_{ij}]$, $1 \leq i, j \leq n$ with $n \geq 3$ and $a_{ij} = i \cdot j$. Then the rank of A is

$$a_{ij} = ij$$

(GATE-07[IN])

- (a) 0
- (b) 1
- (c) $n - 1$
- (d) n

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$$

$\xrightarrow{3 \times 3}$

R_1

$R_2 = 2R_1$

$R_3 = 3R_1$.

$P(A) = 1$

Use the code : BVREDDY, to get the maximum discount

214. $A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}; B = \begin{bmatrix} p^2 + q^2 & pr + qs \\ pr + qs & r^2 + s^2 \end{bmatrix}$

If the rank of matrix A is N, then the rank of matrix B is

(GATE-14-EE-SET3)

- (a) $N/2$
- (b) $N - 1$
- (c) N
- (d) $2N$

$B = AA^T$

$$AA^T = \begin{bmatrix} p & q \\ r & s \end{bmatrix} \begin{bmatrix} p & r \\ q & s \end{bmatrix}$$

$$B = \begin{bmatrix} p^2 + q^2 & pr + qs \\ pr + qs & r^2 + s^2 \end{bmatrix}$$

$\rho(AA^T) = \rho(A) = N$

Use the code : BVREDDY, to get the maximum discount

215. The following system of equations

$$x_1 + x_2 + x_3 = 3$$

$$x_1 - x_3 = 0$$

$$x_1 - x_2 + x_3 = 1 \text{ has}$$

(GATE – 94[EC])

- (a) Unique solution
- (b) No solution
- (c) Infinite number of solutions
- (d) Only one solution

Use the code : BVREDDY, to get the maximum discount

216. Let $AX = B$ be a system of linear equations where A is an $m \times n$ matrix B is an $n \times 1$ column matrix which of the following is false?

(GATE - 96[CS])

- (a) The system has a solution,
if $\rho(A) = \rho(A/B)$
- (b) If $m = n$ and B is a non - zero vector
then the system has a unique solution.
- (c) If $m < n$ and B is a zero vector then the
system has infinitely many solutions.
- (d) The system will have a trivial solution
when $m = n$, B is the zero vector and
rank of A is n .

Use the code : BVREDDY, to get the maximum discount

217. In the Gauss – elimination for a solving system of linear algebraic equations, triangularization leads to

(GATE – 96[ME])

- (a) diagonal matrix
- (b) lower triangular matrix
- (c) upper triangular matrix
- (d) singular matrix

Use the code : BVREDDY, to get the maximum discount

218. For the following set of simultaneous equations **(GATE – 97[ME])**

$$1.5x - 0.5y + z = 2$$

$$4x + 2y + 3z = 9$$

$$7x + y + 5z = 10$$

- (a) the solution is unique
- (b) infinitely many solutions exist
- (c) the equations are incompatible
- (d) finite many solutions exist

Use the code : BVREDDY, to get the maximum discount

219. Consider the following set of equations

$$x + 2y = 5,$$

$$4x + 8y = 12,$$

$3x + 6y + 3z = 15$. This set

(GATE ~ 98[CS])

- (a) has unique solution
- (b) has no solution
- (c) has infinite number of solutions
- (d) has 3 solutions

Use the code : BVREDDY, to get the maximum discount

220. Consider the following system of linear equations **(GATE – 03[CS])**

$$\begin{bmatrix} 2 & 1 & -4 \\ 4 & 3 & -12 \\ 1 & 2 & -8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \alpha \\ 5 \\ 7 \end{bmatrix}$$

Notice that the 2nd and 3rd columns of the coefficient matrix are linearly dependent.

For how many value of α , does systems of equations have infinitely many solutions.

Use the code : BVREDDY, to get the maximum discount

221. A system of equations represented by $AX = 0$ where X is a column vector of unknown and A is a square matrix containing coefficients has a non-trivial solution when A is.

(GATE – 03)

- (a) non-singular
- (b) singular
- (c) symmetric
- (d) Hermitian

Use the code : BVREDDY, to get the maximum discount

222. What values of x, y, z satisfy the following system of linear equations

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 4 \\ 2 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 8 \\ 12 \end{bmatrix}$$

(GATE – 04)

- (a) x = 6, y = 3, z = 2
- (b) x = 12, y = 3, z = -4
- (c) x = 6, y = 6, z = -4
- (d) x = 12, y = -3, z = 4

Use the code : BVREDDY, to get the maximum discount

223. How many solutions does the following system of linear equations have

$$-x + 5y = -1$$

$$x - y = 2$$

$$x + 3y = 3$$

(GATE-04[CS])

- (a) infinitely many
- (b) two distinct solutions
- (c) unique
- (d) none

Use the code : BVREDDY, to get the maximum discount

224. Consider the following system of equations
in three real variable x_1 , x_2 and x_3 :

$$2x_1 - x_2 + 3x_3 = 1$$

$$3x_1 + 2x_2 + 5x_3 = 2$$

$$-x_1 + 4x_2 + x_3 = 3$$

This system of equations has

(GATE-05[CE])

- (a) no solution
- (b) a unique solution
- (c) more than one but a finite number of solutions.
- (d) an infinite number of solutions.

Use the code : BVREDDY, to get the maximum discount

225. Consider the system of equations,

$$A_{n \times n} X_{n \times 1} = \lambda X_{n \times 1} \text{ where } \lambda \text{ is a scalar.}$$

Let (λ_i, X_i) be an eigen value and its corresponding eigen vector for real matrix

A. Let $I_{n \times n}$ be unit matrix. Which one of the following statement is not correct?

(GATE-05[CE])

- (a) For a homogeneous $n \times n$ system of linear equations $(A - \lambda I)X = 0$, having a non trivial solution, the rank of $(A - \lambda I)$ is less than n.
- (b) For matrix A^m , m being a positive integer, (λ_i^m, X_i^m) will be eigen pair for all i.
- (c) If $A^T = A^{-1}$ then $|\lambda_i| = 1$ for all i.
- (d) If $A^T = A$ then λ_i are real for all i.

Use the code : BVREDDY, to get the maximum discount

226. The number of linearly independent solutions of the system of equations

$$\begin{bmatrix} 1 & 0 & 2 \\ 1 & -1 & 0 \\ 2 & -2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = 0 \text{ is equal to}$$

(GATE – 94[EE])

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

Use the code : BVREDDY, to get the maximum discount

227. In the matrix equation $PX = Q$ which of the following is a necessary condition for the existence of atleast one solution for the unknown vector X .

(GATE-05[EE])

- (a) Augmented matrix $[P|Q]$ must have the same rank as matrix P .
- (b) vector Q must have only non-zero elements.
- (c) matrix P must be singular
- (d) matrix P must be square

Use the code : BVREDDY, to get the maximum discount

228. A is a 3×4 matrix and $AX = B$ is an inconsistent system of equations. The highest possible rank of A is

(GATE-05[ME])

- (a) 1 (b) 2 (c) 3 (d) 4

Use the code : BVREDDY, to get the maximum discount

229. Let A be 3×3 matrix with rank 2.

Then $AX = 0$ has

(GATE - 05[IN])

- (a) only the trivial solution $X = 0$
- (b) one independent solution
- (c) two independent solutions
- (d) three independent solutions

Use the code : BVREDDY, to get the maximum discount

230. A system of linear simultaneous equations is given as $Ax = b$

where $A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ & $b = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$

Then the rank of matrix A is

(GATE-06[IN])

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Use the code : BVREDDY, to get the maximum discount

231. A system of linear simultaneous equations is given as $Ax = b$

Where $A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ and $b = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$

Which of the following statement is true?

(GATE-06[IN])

- (a) x is a null vector
- (b) x is unique
- (c) x does not exist
- (d) x has infinitely many values

Use the code : BVREDDY, to get the maximum discount

232. Solution for the system defined by the set of equations $4y + 3z = 8$, $2x - z = 2$ & $3x + 2y = 5$ is
(GATE-06[CE])

- (a) $x = 0, y = 1, z = 4/5$
- (b) $x = 0, y = 1/2, z = 2$
- (c) $x = 1, y = 1/2, z = 2$
- (d) non existent

Use the code : BVREDDY, to get the maximum discount

233. Let A be an $n \times n$ real matrix such that $A^2 = I$ and \mathbf{Y} be an n -dimensional vector. Then the linear system of equations $Ax = \mathbf{Y}$ has

(GATE-07[IN])

- (a) no solution
- (b) unique solution
- (c) more than one but infinitely many dependent solutions.
- (d) infinitely many dependent solutions

Use the code : BVREDDY, to get the maximum discount

234. For what values of α and β the following simultaneous equations have an infinite number of solutions

$$x + y + z = 5,$$

$$x + 3y + 3z = 9,$$

$$x + 2y + \alpha z = \beta$$

(GATE-07[CE])

- (a) 2, 7
- (c) 8, 3

- (b) 3, 8
- (d) 7, 2

Use the code : BVREDDY, to get the maximum discount

235. The number of linearly independent eigen

vectors of $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ is

(GATE-07[ME])

- (a) 0
- (b) 1
- (c) 2
- (d) infinite

Use the code : BVREDDY, to get the maximum discount

236. If A is square symmetric real valued matrix of dimension $2n$, then the eigen values of A are

(GATE – 07[PI])

- (a) $2n$ distinct real values
- (b) $2n$ real values not necessarily distinct
- (c) n distinct pairs of complex conjugate numbers
- (d) n pairs of complex conjugate numbers, not necessarily distinct

Use the code : BVREDDY, to get the maximum discount

237. $q_1, q_2, q_3, \dots, q_m$ are n-dimensional vectors with $m < n$. This set of vectors is linearly dependent. Q is the matrix with $q_1, q_2, q_3, \dots, q_m$ as the columns. The rank of Q is

(GATE-07[EE])

- (a) less than m
- (b) m
- (c) between m and n
- (d) n

Use the code : BVREDDY, to get the maximum discount

238. $X = [x_1 \ x_2 \ \dots \ x_n]^T$ is an n-tuple non-zero vector. The $n \times n$ matrix $V = XX^T$
(GATE-07[CE])

- (a) has rank zero
- (b) has rank 1
- (c) is orthogonal
- (d) has rank n

Use the code : BVREDDY, to get the maximum discount

239. Let x and y be two vectors in a 3-dimensional space and $\langle x, y \rangle$ denote their dot product. Then the determinant \det

$$\begin{bmatrix} \langle x, x \rangle & \langle x, y \rangle \\ \langle y, x \rangle & \langle y, y \rangle \end{bmatrix} = \text{_____}.$$

(GATE-07[EE])

- (a) is zero when x and y are linearly independent
- (b) is positive when x and y are linearly independent
- (c) is non-zero for all non-zero x and y
- (d) is zero only when either x (or) y is zero

Use the code : BVREDDY, to get the maximum discount

240. If the rank of a 5×6 matrix Q is 4 then which one of the following statements is correct?

(GATE-08[EE])

- (a) Q will have four linearly independent rows and four linearly independent columns
- (b) Q will have four linearly independent rows and five linearly independent columns
- (c) $Q Q^T$ will be invertible.
- (d) $Q^T Q$ will be invertible.

Use the code : BVREDDY, to get the maximum discount

241. A is $m \times n$ full rank matrix with $m > n$ and I is an identity matrix.

Let matrix $A^+ = (A^T A)^{-1} A^T$. Then which one of the following statement is false?

(GATE-08[EE])

- (a) $AA^+A = A$
- (b) $(AA^+)^2 = AA^+$
- (c) $A^+A = I$
- (d) $AA^+A = A^+$

Use the code : BVREDDY, to get the maximum discount

242. The system of linear equations

$$\left. \begin{array}{l} 4x + 2y = 7 \\ 2x + y = 6 \end{array} \right\} \text{has } \quad (\text{GATE-08[EC]})$$

- (a) a unique solution
- (b) no solution
- (c) an infinite no. of solutions
- (d) exactly two distinct solution.

Use the code : BVREDDY, to get the maximum discount

243. For what values of 'a' if any will the following system of equations in x, y and z have a solution?

$$2x + 3y = 4,$$

$$x + y + z = 4,$$

$$x + 2y - z = a \quad (\text{GATE-08[ME]})$$

- (a) any real number
- (b) 0
- (c) 1
- (d) there is no such value

Use the code : BVREDDY, to get the maximum discount

244. The following system of equations

$$x_1 + x_2 + 2x_3 = 1, \quad x_1 + 2x_2 + 3x_3 = 2,$$

$$x_1 + 4x_2 + \alpha x_3 = 4 \text{ has a unique solution.}$$

The only possible value(s) for α is/are

(GATE-08[CS])

- (a) 0
- (b) either 0 (or) 1
- (c) one of 0, 1 (or) -1
- (d) any real value expect 5

Use the code : BVREDDY, to get the maximum discount

245. The following system of equations

$$x + y + z = 3,$$

$$x + 2y + 3z = 4,$$

$$x + 4y + kz = 6$$

will not have a unique solution for k equal

to (GATE-08[CE])

Use the code : **BVREDDY**, to get the maximum discount

246. The value of x_3 obtained by solving the following system of linear equations is

$$x_1 + 2x_2 - 2x_3 = 4$$

$$2x_1 + x_2 + x_3 = -2$$

$$-x_1 + x_2 - x_3 = 2$$

(GATE-09[PI])

- (a) -12 (b) -2 (c) 0 (d) 12

Use the code : BVREDDY, to get the maximum discount

247. For the set of equations

$$x_1 + 2x_2 + x_3 + 4x_4 = 2,$$

$$3x_1 + 6x_2 + 3x_3 + 12x_4 = 6.$$

The following statement is true

(GATE-10[EE])

- (a) only the trivial solution

$x_1 = x_2 = x_3 = x_4 = 0$ exist

- (b) there are no solutions

- (c) a unique non-trivial solution exist

- (d) multiple non-trivial solution exist

Use the code : BVREDDY, to get the maximum discount

248. The value of q for which the following set of linear equations $2x + 3y = 0$, $6x + qy = 0$ can have non-trivial solution is

(GATE-10[PI])

- (a) 2
- (b) 7
- (c) 9
- (d) 11

Use the code : BVREDDY, to get the maximum discount

249. The system of equations $x + y + z = 6$,
 $x + 4y + 6z = 20$, $x + 4y + \lambda z = \mu$ has no
solution for values of λ and μ given by

(GATE-11[EC])

- | | |
|--------------------------------|-----------------------------------|
| (a) $\lambda = 6, \mu = 20$ | (b) $\lambda = 6, \mu \neq 20$ |
| (c) $\lambda \neq 6, \mu = 20$ | (d) $\lambda \neq 6, \mu \neq 20$ |

Use the code : BVREDDY, to get the maximum discount

250. Consider the following system of equations

$$2x_1 + x_2 + x_3 = 0, \quad x_2 - x_3 = 0 \text{ and } x_1 + x_2 = 0.$$

This system has **(GATE-11[ME])**

- (a) a unique solution
- (b) no solution
- (c) infinite number of solutions
- (d) five solutions

Use the code : BVREDDY, to get the maximum discount

251. $x + 2y + z = 4$, $2x + y + 2z = 5$, $x - y + z = 1$

The system of algebraic equations given above has

(GATE-12[ME, PI])

- (a) a unique solution of $x=1$, $y=1$ and $z=1$
- (b) only the two solutions of $x=1$, $y=1$, $z=1$ and $x=2$, $y=1$, $z=0$
- (c) infinite number of solutions.
- (d) no feasible solution.

Use the code : BVREDDY, to get the maximum discount

252. The equation

$$\begin{bmatrix} 2 & -2 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \text{ has}$$

(GATE – 13[EE])

- (a) no solution
- (b) only one solution
- (c) non-zero unique solution
- (d) multiple solutions

Use the code : BVREDDY, to get the maximum discount

253. Choose the CORRECT set of functions, which are linearly dependent.

(GATE – 2013[ME])

- (a) $\sin x$, $\sin^2 x$ and $\cos^2 x$
- (b) $\cos x$, $\sin x$ and $\tan x$
- (c) $\cos 2x$, $\sin^2 x$ and $\cos^2 x$
- (d) $\cos 2x$, $\sin x$ and $\cos x$

Use the code : BVREDDY, to get the maximum discount

254. The system of linear equations

$$\begin{pmatrix} 2 & 1 & 3 \\ 3 & 0 & 1 \\ 1 & 2 & 5 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \\ 14 \end{pmatrix} \text{ has}$$

(GATE-14-EC-SET2)

- (a) a unique solution
- (b) infinitely many solutions
- (c) no solution
- (d) exactly two solutions

Use the code : BVREDDY, to get the maximum discount

255. Which one of the following statements is NOT true for a square matrix A?

(GATE-14-EC-SET3)

- (a) If A is upper triangular, the eigen values of A are the diagonal elements of it
- (b) If A is real symmetric, the eigen values of A are always real and positive
- (c) If A is real, the eigen values of A and A^T are always the same
- (d) If all the principal minors of A are positive, all the eigen values of A are also positive

Use the code : BVREDDY, to get the maximum discount

256. Given a system of equations

$$x + 2y + 2z = b_1$$

$$5x + y + 3z = b_2$$

Which of the following is true its solutions

(GATE-14-EE-SET1)

- (a) The system has a unique solution for any given b_1 and b_2
- (b) The system will have infinitely many solutions for any given b_1 and b_2
- (c) Whether or not a solution exists depends on the given b_1 and b_2
- (d) The system would have no solution for any values of b_1 and b_2

Use the code : BVREDDY, to get the maximum discount

257.Which one of the following describes the relationship among the three vectors,
 $\hat{i} + \hat{j} + \hat{k}$, $2\hat{i} + 3\hat{j} + \hat{k}$ and $5\hat{i} + 6\hat{j} + 4\hat{k}$?

(GATE-14-ME-SET1)

- (a) The vectors are mutually perpendicular
- (b) The vectors are linearly dependent
- (c) The vectors are linearly independent
- (d) The vectors are unit vectors

Use the code : BVREDDY, to get the maximum discount

258. The rank of the matrix $\begin{bmatrix} 6 & 0 & 4 & 4 \\ -2 & 14 & 8 & 18 \\ 14 & -14 & 0 & -10 \end{bmatrix}$ is
(GATE-14-CE-SET2)

Use the code : BVREDDY, to get the maximum discount

259. The system of equations, given below, has

$$x + 2y + 4z = 2$$

$$4x + 3y + z = 5$$

$$3x + 2y + 3z = 1$$

(GATE-14-PI-SET1)

- (a) a unique solution
- (b) Two solution
- (c) no solution
- (d) more than two solutions

Use the code : BVREDDY, to get the maximum discount

260. Consider the following system of equations:

$$3x + 2y = 1$$

$$4x + 7z = 1$$

$$x + y + z = 3$$

$$x - 2y + 7z = 0$$

The number of solutions for this system is

(GATE-14-CS-SET1)

Use the code : BVREDDY, to get the maximum discount

261. Consider the system of linear equations:

$$x - 2y + 3z = -1$$

$$x - 3y + 4z = 1 \text{ and}$$

$$-2x + 4y - 6z = k,$$

The value of 'k' for which the system has infinitely many solutions is _____.

(GATE-15-EC-SET1)

Use the code : BVREDDY, to get the maximum discount

262. The maximum value of 'a' such that the

matrix $\begin{bmatrix} -3 & 0 & -2 \\ 1 & -1 & 0 \\ 0 & a & -2 \end{bmatrix}$ has three linearly

independent real eigenvectors is

(GATE 15-EE-SET1)

(a) $\frac{2}{3\sqrt{3}}$

(b) $\frac{1}{3\sqrt{3}}$

(c) $\frac{1+2\sqrt{3}}{3\sqrt{3}}$

(d) $\frac{1+\sqrt{3}}{3\sqrt{3}}$

Use the code : BVREDDY, to get the maximum discount

263. We have a set of 3 linear equations in 3 unknowns. ' $X \equiv Y$ ' means X and Y are equivalent statements and ' $X \not\equiv Y$ ' means X and Y are not equivalent statements.

P: There is a unique solution.

Q: The equations are linearly independent.

R: All eigen values of the coefficient matrix are non zero.

S: The determinant of the coefficient matrix is nonzero.

Which one of the following is TRUE?

(GATE-15-EE-SET2)

- (a) $P \equiv Q \equiv R \equiv S$
- (b) $P \equiv R \not\equiv Q \equiv S$
- (c) $P \equiv Q \not\equiv R \equiv S$
- (d) $P \not\equiv Q \not\equiv R \not\equiv S$

Use the code : BVREDDY, to get the maximum discount

264. Let A be an $n \times n$ matrix with rank r ($0 < r < n$). Then $AX = 0$ has p independent solutions, where p is

(GATE - 15 - IN)

- (a) r
- (b) n
- (c) $n - r$
- (d) $n + r$

Use the code : BVREDDY, to get the maximum discount

265. For what value of 'p' the following set of equations will have no solution?

$$2x + 3y = 5$$

$$3x + py = 10 \quad (\text{GATE - 15 - CE - Set 1})$$

Use the code : BVREDDY, to get the maximum discount

266. Let $A = [a_{ij}]$, $1 \leq i, j \leq n$ with $n \geq 3$ and $a_{ij} = i \cdot j$.

The rank of A is :

(GATE – 15 – CE – Set 2)

Use the code : BVREDDY, to get the maximum discount

267. If the following system has non – trivial solution

$$px + qy + rz = 0$$

$$qx + ry + pz = 0$$

$$rx + py + qz = 0$$

Then which one of the following Options is
TRUE? **(GATE – 15 – CS – Set 3)**

- (a) $p - q + r = 0$ or $p = q = -r$
- (b) $p + q - r = 0$ or $p = -q = r$
- (c) $p + q + r = 0$ or $p = q = r$
- (d) $p - q + r = 0$ or $p = -q = -r$

Use the code : BVREDDY, to get the maximum discount

268. Let the eigen values of a 2×2 matrix A be 1, -2 with eigen vectors x_1 and x_2 respectively. Then the eigen values and eigen vectors of the matrix $A^2 - 3A + 4I$ would respectively, be

- (a) 2, 14; x_1, x_2
- (c) 2, 0; x_1, x_2

- (b) 2, 14; x_1, x_2 ; $x_1 - x_2$
- (d) 2, 0; $x_1 + x_2, x_1 - x_2$

(GATE-16-EE)

Use the code : BVREDDY, to get the maximum discount

269. Let A be a 4×3 real matrix which rank 2. Which one of the following statement is **TRUE**?

- (a) Rank of A^T is less than 2
- (b) Rank of $A^T A$ is equal to 2
- (c) Rank of $A^T A$ is greater than 2
- (d) Rank of $A^T A$ can be any number between 1 and 3

(GATE-16-EE)

Use the code : BVREDDY, to get the maximum discount

270. The solution to the system of equations is

$$\begin{bmatrix} 2 & 5 \\ -4 & 3 \end{bmatrix} \begin{Bmatrix} x \\ y \end{Bmatrix} = \begin{Bmatrix} 2 \\ -30 \end{Bmatrix}$$

- (a) 6, 2
(c) -6, -2

- (b) -6, 2
(d) 6, -2

(GATE-16-ME)

Use the code : BVREDDY, to get the maximum discount

271. The number of linear independent eigenvectors of matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ is _____.

(GATE-16-ME)

Use the code : BVREDDY, to get the maximum discount

272. The number of solutions of the simultaneous algebraic equations $y = 3x + 3$ and $y = 3x + 5$ is

- (a) zero
- (b) 1
- (c) 2
- (d) infinite

(GATE-16-PI)

Use the code : BVREDDY, to get the maximum discount

273. Consider the following linear system

$$x + 2y - 3z = a$$

$$2x + 3y + 3z = b$$

$$5x + 9y - 6z = c$$

This system is consistent if a, b, c satisfies the equation

(GATE-16-CE)

- (a) $7a - b - c = 0$
(c) $3a - b + c = 0$

- (b) $3a + b - c = 0$
(d) $7a - b + c = 0$

Use the code : BVREDDY, to get the maximum discount

274. Consider the systems, each consisting of m linear equations in n variables.

- I.** If $m < n$, then all such systems have a solution
- II.** If $m > n$, then none of these systems has a solution
- III.** If $m = n$, then there exists a system which has a solution

Which one of the following is **CORRECT**?

- (a) **I, II and III** are true
- (b) Only **II and III** are true
- (c) Only **III** is true
- (d) None of them is true

(GATE-16-CSE)

Use the code : BVREDDY, to get the maximum discount

275. If V is a non-zero vector of dimension 3×1 , then the matrix $A = VV^T$ has a rank = _____
(GATE-17-IN)

Use the code : BVREDDY, to get the maximum discount

276. The rank of the matrix $\begin{bmatrix} 1 & -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 \end{bmatrix}$ is _____

(GATE-17-EC)

Use the code : BVREDDY, to get the maximum discount

277. The rank of the matrix $M = \begin{bmatrix} 5 & 10 & 10 \\ 1 & 0 & 2 \\ 3 & 6 & 6 \end{bmatrix}$ is

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

(GATE-17-EC)

Use the code : BVREDDY, to get the maximum discount

278. Consider the following simultaneous equations (with c_1 and c_2 being constants):

$$3x_1 + 2x_2 = c_1$$

$$4x_1 + x_2 = c_2$$

The characteristic equation for these simultaneous equations is

(GATE-17-CE)

(a) $\lambda^2 - 4\lambda - 5 = 0$

(c) $\lambda^2 + 4\lambda - 5 = 0$

(b) $\lambda^2 - 4\lambda + 5 = 0$

(d) $\lambda^2 + 4\lambda + 5 = 0$

Use the code : BVREDDY, to get the maximum discount

279. The rank of the following matrix is

$$\begin{bmatrix} 1 & 1 & 0 & -2 \\ 2 & 0 & 2 & 2 \\ 4 & 1 & 3 & 1 \end{bmatrix}$$

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Use the code : BVREDDY, to get the maximum discount

280. Consider matrix $A = \begin{bmatrix} k & 2k \\ k^2 - k & k^2 \end{bmatrix}$ and vector $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$. The number of distinct real values of k for which the equation $Ax = 0$ has infinitely many solutions is _____.

(GATE-18-EC)

Use the code : BVREDDY, to get the maximum discount

281. Let M be a real 4×4 matrix. Consider the following statements:

S_1 : M has 4 linearly independent eigenvectors

S_2 : M has 4 distinct eigen values.

S_3 : M is non-singular (invertible).

Which one among the following is TRUE?

- (a) S_1 implies S_2
(c) S_2 implies S_1

- (b) S_1 implies S_3
(d) S_3 implies S_2

(GATE-18-EC)

Use the code : BVREDDY, to get the maximum discount

282. Consider the following system of linear equation

$$3x + 2ky = -2$$

$$kx + 6y = 2$$

Here x and y are the unknowns and k is a real constant. The value of k for which there are infinite number of solutions is

- | | |
|--------|--------|
| (a) 3 | (b) 1 |
| (b) -3 | (d) -6 |
- (GATE-18-IN)**

Use the code : BVREDDY, to get the maximum discount

283. The rank of the matrix $\begin{bmatrix} -4 & 1 & -1 \\ -1 & -1 & -1 \\ 7 & -3 & 1 \end{bmatrix}$ is

(GATE-18-ME)

Use the code : BVREDDY, to get the maximum discount

284. The rank of the matrix, $M = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$, is _____.

(GATE-19-EE)

Use the code : BVREDDY, to get the maximum discount

285. The set of equations $x + y + z = 1$, $ax - ay + 3z = 5$, $5x - 3y + az = 6$ has infinite solutions, if $a =$

- (a) 4
- (b) 3
- (c) -4
- (d) -3

(GATE-19-ME)

Use the code : BVREDDY, to get the maximum discount

286. Euclidean norm (length) of the vector $[4 \quad -2 \quad -6]^T$ is

- (a) $\sqrt{56}$
- (c) $\sqrt{48}$

- (b) $\sqrt{24}$
- (d) $\sqrt{12}$

(GATE-19-CE)

Use the code : BVREDDY, to get the maximum discount

287. Consider the system of equations

$$\begin{bmatrix} 1 & 3 & 2 \\ 2 & 2 & -3 \\ 4 & 4 & -6 \\ 2 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 2 \\ 1 \end{bmatrix}$$

The value of x_3 (round off to the nearest integer), is _____.

(GATE-2020(CE))

Use the code : BVREDDY, to get the maximum discount

288. Let A and B be two $n \times n$ matrices over real numbers. Let $\text{rank}(M)$ and $\det(M)$ denote the rank and determinant of a matrix M, respectively. Consider the following statements:

- I. $\text{rank}(AB) = \text{rank}(A) \text{rank}(B)$
- II. $\det(AB) = \det(A) \det(B)$
- III. $\text{rank}(A + B) \leq \text{rank}(A) + \text{rank}(B)$
- IV. $\det(A + B) \leq \det(A) + \det(B)$

Which of the above statements are TRUE?

- (a) III and IV only (b) II and III only
(c) I and IV only (d) I and II only

(GATE-2020 (CS))

Use the code : BVREDDY, to get the maximum discount

289. The rank of the matrix $\begin{bmatrix} 1 & 2 & 2 & 3 \\ 3 & 4 & 2 & 5 \\ 5 & 6 & 2 & 7 \\ 7 & 8 & 2 & 9 \end{bmatrix}$ is

(GATE-21-CE)

- (a) 4
- (b) 2
- (c) 1
- (d) 3

Use the code : BVREDDY, to get the maximum discount

290. The rank of the matrix $\begin{bmatrix} 5 & 0 & -5 & 0 \\ 0 & 2 & 0 & 1 \\ -5 & 0 & 5 & 0 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ is

(GATE-21-CE)

- (a) 1
- (b) 2
- (c) 3
- (d) 4

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291. Consider an $n \times n$ matrix A and a non-zero $n \times 1$ vector p . Their product $Ap = \alpha^2 p$, where $\alpha \in \mathbb{R}$ and $\alpha \notin \{-1, 0, 1\}$. Based on the given information, the eigen value of A^2 is:
(GATE-21-ME)

- (a) α
- (b) α^2
- (c) $\sqrt{\alpha}$
- (d) α^4

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292. Suppose that P is a 4×5 matrix such that every solution of the equation $Px = 0$ is a scalar multiple of $[2 \ 5 \ 4 \ 3 \ 1]^T$. The rank of P is **(GATE-2021-cs)**

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293. Consider the rows vectors $v = (1, 0)$ and $w = (2, 0)$. The rank of the matrix $M = 2v^T v + 3w^T w$, where the superscript T denotes the transpose , is

(GATE – 2021 – IN)

- (a) 3
- (b) 2
- (c) 4
- (d) 1

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294. Let c_1, \dots, c_n be scalars, not all zero, such that $\sum_{i=1}^n c_i a_i = 0$ where a_i are column vectors in R^n . Consider the set of linear equations $Ax = b$

Where $A = [a_1, \dots, a_n]$ and $b = \sum_{i=1}^n a_i$. The set of equations has

(GATE-17-CSIT)

- (a) A unique solution at $x = j_n$ where j_n denotes a n -dimensional vector of all 1
- (b) no solution
- (c) infinitely many solutions
- (d) finitely many solutions

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295. P and Q are two square matrices of the same order. Which of the following statement(s) is/are correct?

(GATE-2022-CE)

- (a) If P and Q are invertible, then $[PQ]^{-1} = Q^{-1}P^{-1}$
- (b) If P and Q are invertible, then $[QP]^{-1} = P^{-1}Q^{-1}$
- (c) If P and Q are invertible, then $[PQ]^{-1} = P^{-1}Q^{-1}$
- (d) If P and Q are not invertible, then $[PQ]^{-1} = Q^{-1}P^{-1}$

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296. The matrix M is defined as

$$M = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$$

and has eigenvalues 5 and 2. The matrix Q is formed as

$$Q = M^3 - 4M^2 - 2M$$

Which of the following is/are the eigenvalue(s) of matrix Q

(GATE-2022-CE)

- (a) 15
- (b) 25
- (c)-20
- (d) -30

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297. Consider the following two statements with respect to the matrices $A_{m \times n}$, $B_{n \times m}$, $C_{n \times n}$, $D_{n \times n}$

Statement 1: $\text{tr}(AB) = \text{tr}(BA)$

Statement 2: $\text{tr}(CD) = \text{tr}(DC)$

where $\text{tr}()$ represents the trace of a matrix. Which one of the following holds?

(GATE-2022-CSE)

- (a) Statement 1 is correct and Statement 2 is wrong.
- (b) Statement 1 is wrong and Statement 2 is correct.
- (c) Both Statement 1 and Statement 2 are correct.
- (d) Both Statement 1 and Statement 2 are wrong.

Use the code : BVREDDY, to get the maximum discount

298. Consider solving the following system of simultaneous equations using LU decomposition.

$$x_1 + x_2 - 2x_3 = 4$$

$$x_2 + 3x_3 - x_1 = 7$$

$$2x_1 + x_2 - 5x_3 = 7$$

Where L and U are denoted as

$$L = \begin{bmatrix} L_{11} & 0 & 0 \\ L_{21} & L_{22} & 0 \\ L_{31} & L_{32} & L_{33} \end{bmatrix}, \quad U = \begin{bmatrix} U_{11} & U_{12} & U_{13} \\ 0 & U_{22} & U_{23} \\ 0 & 0 & L_{33} \end{bmatrix}$$

Which one of the following is the correct combination of values for L_{32} , U_{33} , and x_1 ?

(GATE-2022-CSE)

- (a) $L_{32} = 2$, $U_{33} = -\frac{1}{2}$, $x_1 = -1$
- (b) $L_{32} = 2$, $U_{33} = 2$, $x_1 = -1$
- (c) $L_{32} = -\frac{1}{2}$, $U_{33} = 2$, $x_1 = 0$
- (d) $L_{32} = -\frac{1}{2}$, $U_{33} = -\frac{1}{2}$, $x_1 = 0$

Use the code : BVREDDY, to get the maximum discount

299. Which of the following is/are the eigenvector(s) for the matrix given below?

$$\begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix}$$

(GATE-2022-CSE)

(a) $\begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$

(b) $\begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}$

(c) $\begin{bmatrix} -1 \\ 0 \\ 2 \\ 2 \end{bmatrix}$

(d) $\begin{bmatrix} 0 \\ 1 \\ -3 \\ 0 \end{bmatrix}$

Use the code : BVREDDY, to get the maximum discount

300. Consider a system of linear equations $Ax=b$, where

$$A = \begin{bmatrix} 1 - \sqrt{2} & 3 \\ -1 & \sqrt{2} - 3 \end{bmatrix}, b = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

This system of equations admits _____

(GATE-2022-ECE)

- (a) a unique solution for x
- (b) infinitely many solutions for x
- (c) no solutions for x
- (d) exactly two solutions for x

Use the code : BVREDDY, to get the maximum discount

301. Consider a matrix 3×3 A whose $(i, j)^{\text{th}}$ element = $(i - j)^3$, then the matrix A will be
(GATE-2022-EEE)

- (a) Symmetric
- (b) Skew symmetric
- (c) Unitary
- (d) Null

Use the code : BVREDDY, to get the maximum discount

302. Consider matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & -2 \\ 0 & 1 & 1 \end{bmatrix}$, the matrix A is satisfy the equation $6A^{-1} = A^2 + cA + dI$ where c and d are scalars and I is the identity matrix, the $(c + d)$ is equal to

(GATE-2022-EEE)

- (a) 5
- (b) 17
- (c) -6
- (d) 11

Use the code : BVREDDY, to get the maximum discount

303. e^A denotes the exponential of a square matrix A. Suppose λ is an eigen value and v is the corresponding eigen vector of matrix A.

Consider the following two statement

Statement 1: e^λ is an eigen value of e^A

Statement 2: v is an eigen vector of e^A .

Which one of the following option is correct.?

(GATE-2022-EEE)

- (a) Statement 1 is true and Statement 2 is false
- (b) Statement 1 is false and Statement 2 is true
- (c) Both the statements are correct
- (d) Both statements are false

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304. Given $M = \begin{bmatrix} 2 & 3 & 7 \\ 6 & 4 & 7 \\ 4 & 6 & 14 \end{bmatrix}$, which of the following statement(s) is/are correct?

(GATE-2022-IN)

- (a) The rank of M is 2
- (b) The rank of M is 3
- (c) The rows of M are linearly independent
- (d) The determinant of M is 0

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305. The matrix $A = \begin{bmatrix} 4 & 3 \\ 9 & -2 \end{bmatrix}$ has eigen values - 5 and 7.

The eigenvector(s) is/are _____

(GATE-2022-IN)

- (a) $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$
- (b) $\begin{bmatrix} 13 \\ 4 \end{bmatrix}$
- (c) $\begin{bmatrix} 2 \\ -6 \end{bmatrix}$
- (d) $\begin{bmatrix} 2 \\ 8 \end{bmatrix}$

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306. If $A = \begin{bmatrix} 10 & 2k+5 \\ 3k-5 & k+5 \end{bmatrix}$ is a symmetric matrix, the value of k is _____ (GATE-2022-ME)

- (a) 8
- (b) 10
- (c) -0.4
- (d) $\frac{1+\sqrt{1561}}{12}$

Use the code : BVREDDY, to get the maximum discount

307. The system of linear equations in real (x, y) given by

$$(x \ y) \begin{bmatrix} 2 & 5 - 2\alpha \\ \alpha & 1 \end{bmatrix} = (0 \ 0)$$

involves a real parameter α and has infinitely many non-trivial solutions for special value(s) of α . Which one or more among the following options is/are non-trivial solution(s) of (x, y) for such special value(s) of α ?

(GATE-2022-ME)

- (a) $x = 2, y = -2$
- (b) $x = -1, y = 4$
- (c) $x = 1, y = 1$
- (d) $x = 4, y = -2$

Use the code : BVREDDY, to get the maximum discount

308. A is a 3×5 real matrix of rank 2. For the set of homogeneous equations $Ax = 0$, where 0 is a zero vector and x is a vector of unknown variables, which of the following is/are true?

(GATE-2022-ME)

- (a) The given set of equations will have a unique solution.
- (b) The given set of equations will be satisfied by a zero vector of appropriate size.
- (c) The given set of equations will have infinitely many solutions.
- (d) The given set of equations will have many but a finite number of solutions.

Use the code : BVREDDY, to get the maximum discount

309. If the sum and product of eigen values of a 2×2 matrix $\begin{bmatrix} 3 & p \\ p & q \end{bmatrix}$ are 4 and -1 respectively, then $|p|$ is _____ (in integer).

(GATE-2022-ME)

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310. Matrix A as product of two other matrices is given by

$$A = \begin{bmatrix} 3 \\ 2 \end{bmatrix} [1 \quad 4]$$

The value of $\det(A)$ is _____ [round off to nearest integer]

(GATE-2022-PI)

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311. If a matrix is squared, then

(GATE-2022-PI)

- (a) both eigenvalues and eigenvectors are retained.
- (b) eigenvalues get squared but eigenvectors are retained.
- (c) both eigenvalues and eigenvectors must change.
- (d) eigenvalues are retained but eigenvectors change.

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