| 2020-21 Onwards (MR-20) | MALLA REDDY ENGINEERING COLLEGE (Autonomous) | B.Tech. I Semester | | |
|---|---|---|---|---|
| Code: A0B03 | Linear Algebra and Applied Calculus<br>(Common For ECE & EEE)<br>I B. Tech I Sem I Mid Subjective Question Bank | L | T | P |
| Credits: 4 | | 3 | 1 | - |

| Q.No. | Questions | Bloom's Taxonomy Level | CO |
|---|---|---|---|
| **Module-I** | | | |
| 1. | Define the rank of the matrix and find the rank of the following matrix<br>$A=\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ | Remembering/ Applying | 1 |
| 2. | By Reducing the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ into normal form, Find the rank. | Applying | 1 |
| 3. | Discuss for what values of $\lambda, \mu$ the simultaneous equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ have<br>(i)no solution (ii) a unique solution (iii) an infinite number of solutions | Applying | 1 |
| 4. | Prove that the following set of equations are consistent and solve them<br>$3x+3y+2z=1$<br>$x+2y=4$<br>$10y+3z=-2$<br>$2x-3y-z=5$ | Applying | 1 |
| 5. | Solve the system of equations<br>$x+y+w=0$<br>$y+z=0$<br>$x+y+z+w=0$<br>$x+y+2z=0$ | Applying | 1 |
| 6. | Solve the following system of equations by LU-Decomposition method<br>$x+y+z=6$<br>$2x+3y-2z=2$<br>$5x+y+2z=13$ | Applying | 1 |

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| | **Module-II** | | |
| 1. | Determine the characteristic roots and corresponding characteristic vectors of the matrix A= $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | Evaluating | 2 |
| 2. | a) If $\lambda$ is the eigen value of A corresponding eigen vector X, then prove that $\lambda^n$ is the eigen value of $A^n$ corresponding to the eigen vector X<br>b) A square matrix A and its transpose have the same eigen values. | Understanding | 2 |
| 3. | Find a matrix P which transform the matrix A= $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ to diagonal form. Hence calculate $A^4$. | Analyzing | 2 |
| 4. | If A= $\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ .Verify Cayley-Hamilton theorem. Find $A^4$ and $A^{-1}$ using Cayley-Hamilton theorem | Applying | 2 |
| 5. | If A= $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ ,Find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I.$ | Applying | 2 |
| 6. | Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ in to canonical form by orthogonal reduction. | Analyzing | 2 |
| | **Module-III** | | |
| 1. | Find the equation of the system of orthogonal trajectories of the family of curves $r^n \sin n\theta = a^n$, where 'a' is the parameter. | Applying | 3 |
| 2. | A copper ball is heated to a temperature of $80^o$c .Then at time t=0 it is placed in water which is maintained at $30^o c$ .If at t=3 minutes, the temperature of the ball is reduced to $50^o c$ . Find the time at which the temperature of the ball is $40^o c$ | Applying | 3 |
| 3. | The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after $1\frac{1}{2}$ hour | Applying | 3 |

**Signature of the faculty** **Signature of HOD**

# MALLA REDDY ENGINEERING COLLEGE (Autonomous)

**Maisammaguda, Dhulapally, Kompally, Secunderabad – 500 100**

**I B.Tech.ISEMESTER MID - I Objective Questions**

**MR-20 REGULATIONS** **Sub: LA&AC**

1) $Rank\ of\ A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}\ is$ [ ]

A)3 B)0 C)2 D)None

2) $If\ A\ is\ a\ matrix\ of\ order\ m \times n\ then\ \rho[A] \leq$ [ ]

A) min(m,n) B) max(m,n) C) equal to m D) None

3) $Rank\ of \begin{bmatrix} 3 & 4 & 5 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} is$ _____ [ ]

A)1 B) 2 C) 3 D) None

4) The necessary and sufficient condition that the system of equations AX =B is consistent is [ ]

A) ρ[A⁄B]=ρ[A] B) ρ[A⁄B]≠ρ[A] C) ρ[A⁄B]<ρ[A] D) None

5) The system of equations AX = B has no solution if _____ [ ]

A) ρ[A⁄B]=ρ[A]B) ρ[A⁄B]≠ρ[A] C) ρ[A⁄B]<ρ[A] D) None

6) If n is the number of unknowns, r is rank of A, for the system AX = B has a unique solution if [ ]

A) ρ[A⁄B]=ρ[A]=r=n B) ρ[A⁄B]≠ρ[A] C) ρ[A⁄B]=ρ[A]=r<n D) None

7) If n is the number of unknowns, "r" is rank of A, for the system AX = B has a infinite number of solution if

A) ρ[A⁄B]=ρ[A]=r=n B) ρ[A⁄B]≠ρ[A]=r>n C) ρ[A⁄B]=ρ[A]=r<n D) None [ ]

8) $The\ rank\ of\ \ the\ matrix\ A = \begin{bmatrix} 3 & 3 & 3 & 3 \\ 3 & 3 & 3 & 3 \\ 3 & 3 & 3 & 3 \\ 3 & 3 & 3 & 3 \end{bmatrix} is$ [ ]

A)4 B)3 C)2 D)1

9) If A is hermitian matrix then iA is ____ [ ]

A) Hermitian B) Skew hermitian C) Unitary D) Idempotent

10) The system of equations x+y+z=2;2x+2y +2z=4; 3x+3y+3z=6 has [ ]

A) no solution B) infinite solutions C) unique solution D) None

11) $The\ value\ of\ x\ and\ y\ if \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$ [ ]

A) x=4,y=5 B) x=4,y=-3 C) x=1,y=2 D) x=4,y=-5

12) Transpose of unitary matrix is---------- [ ]

A) Unitary B) hermitian C) idempodent D)nilpotent

13) If A is a matrix of order 4x5 and the rank of A is 2, the normal form reduced matrix of A is [ ]

$A)\begin{bmatrix}1&0&0&0&0\\0&1&0&0&0\\0&0&1&0&0\\0&0&0&0&0\end{bmatrix}$ B) $\begin{bmatrix}1&0&0&0&0\\0&1&0&0&0\\0&0&0&0&0\\0&0&0&0&0\end{bmatrix}$ C) $\begin{bmatrix}1&0&0&0&0\\0&1&0&0&0\\0&0&1&0&0\\0&0&0&1&0\end{bmatrix}$ D) $None$

14) The determinant of an orthogonal matrix is [ ]

A) ±1 B)<1 C) 0 D) None

15) $The\ rank\ of\ the\ matrix \begin{bmatrix}k&-1&0\\0&k&-1\\-1&0&k\end{bmatrix}\ is\ 2\ for\ k\ =$ [ ]

A)0 B)2 C) 1 D) None

16)The system of equations x+2y=5 , -2x+ay =4 are consistent if_____ [ ]

A) a=-4 B) a=4 C) a≠-4 D)none

17)If A and B are matrices and if AB is defined then the rank of AB is equals to____ [ ]

A)rank of A B) rank of B C) ≤min{rank of A, rank of B} D)None

18) If A is orthogonal matrix then $A^{-1}$ equals to _____ [ ]

A)A B) $A^T$ C) $A^2$ D)None

19) Which of the following is Skew symmetric matrix_____ [ ]

A) $\begin{bmatrix}2&1&-2\\-1&2&-1\\1&0&5\end{bmatrix}$ B) $\begin{bmatrix}2&-1&-2\\-1&2&1\\1&0&5\end{bmatrix}$ C) $\begin{bmatrix}2&1&-2\\-1&2&1\\-1&0&-5\end{bmatrix}$ D) $\begin{bmatrix}0&-3&-2\\3&0&-4\\2&4&0\end{bmatrix}$

20) Which of the following is Symmetric matrix is_____ [ ]

A) $\begin{bmatrix}2&1&-2\\-1&2&-1\\1&0&5\end{bmatrix}$ $B)\begin{bmatrix}2&-1&-2\\-1&2&1\\1&0&5\end{bmatrix}$ $C)\begin{bmatrix}2&1&-2\\-1&2&1\\-1&0&-5\end{bmatrix}$ $D)\begin{bmatrix}2&-1&-2\\-1&2&1\\-2&1&-5\end{bmatrix}$

21) The rank of a unit matrix of order 'n' is _____ [ ]

A)n+2 B) n-1 C)n D)n+1

22) The rank of the matrix A=$\begin{bmatrix}2&1&3\\4&2&6\\2&1&3\end{bmatrix}$ is_____ [ ]

A)1 B)0 C) n D)n+1

23) Which of the following is true [ ]

A)The determinant of orthogonal matrix is ±1 B) The product of two unitary matrices is unitary

C) If A is symmetric then BTAB is also symmetric D) All are true

24) The rank of a singular matrix of order n is _____ [ ]

A)≤n-1 B) n C) n-2 D)≤n

25)The rank of a non-singular matrix of order n is _____ [ ]

A)1 B)0 C)n D)n+1

26) Which of the following is true [ ]

A) If A is symmetric matrix then A2 is also symmetric matrix

B) The product of two orthogonal matrices is orthogonal

C) The Rank of the matrix of order 1 ×230443 is 1

D) All are true

27) The values of 'k ' for which the equations x+y+z=1,4x+y+10z=$k^2$,2x+y+4z=k have a solution is_____

A) 1 B)-2 C)3 D)6 [ ]

28) If A be nxn matrix of rank 'n', then rank of Adj A is_____ [ ]

A) 1 B)0 C)n D)n+1

29) The rank of a matrix every element of which is unity is_____ [ ]

A)1 B) 2 C)3 D)6

30) If a square A can be expressed as a sum of Symmetric matrix P and skew symmetric matrix Q

then P and Q are ____ [ ]

A) Singular B) Non-Singular C) Null D)None

31) $If\ the\ rank\ of\ matrix\ A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & x & 4 \\ 1 & -1 & 1 \end{bmatrix}\ is\ 2\ then\ the\ value\ of\ x\ is$ _____ [ ]

A)1 B)2 C)3 D)6

32) For the system AX = B,ρ[A/B]≠ρ[A] then the system has _____ solution [ ]

A) No B) Unique C) Infinite D) Trivial

33) $For\ [A/B] = \left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & a-8 & b-15 \end{array}\right]\ if\ b \neq 15, a \neq 8, the\ system\ has$ _____ [ ]

A) No solution B) Unique solution C) Infinite solution D) Trivial solution

34) If$[A/B] = \left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & a-8 & b-15 \end{array}\right]$ and if $a = 8, b = 15, \rho[A/B]$ =_____ [ ]

A)1 B)2 C)3 D)6

35) $If\ [A/B] = \left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & a-8 & b-15 \end{array}\right]\ and\ if\ a = 8, b \neq 15, \rho[A/B] =$ ____ [ ]

A)1 B)2 C)3 D)6

36) If there are 4 non homogeneous equations in 6 unknowns then the system has [ ]

A)No Solution B) Unique Solution C) Infinite Solution D) none

37) $The\ rank\ of\ A = \begin{bmatrix} 0 & 1 & -1 \\ 2 & 0 & 4 \\ 3 & -2 & 0 \end{bmatrix}\ is$ ---------- [ ]

A)1 B)2 C)3 D)6

38) For the system AX =O,ρ[A]=n (no.of unknowns)then the system has _____ solution [ ]

A)No Solution B) Non-trivial C) Trivial D)None

39) The determinant of matrix Ais of order 3x3 is zero and determinant of a at least one sub-matrix of order 2 is not equal to zero then the rank of A is _____ [ ]

A)1 B)2 C)3 D)6

40) $\begin{vmatrix} cos\theta & sin\theta \\ -sin\theta & cos\theta \end{vmatrix}$ = _____ [ ]

A)1 B)2 C)3 D)6

41) For the system AX = O,ρ[A]<n (no.of unknowns)then the system has _____ solution [ ]

A) No Solution B) Non-trivial Solution C) Trivial Solution D)None

42) If A is any square matrix is said to be Symmetric matrix then [ ]

$A)\ A' = A \quad B)A' = -A \quad C)AA^T = A^TA = I \quad D)A^m = 0$

43) If A is any square matrix is said to be Skew-Symmetric matrix then [ ]

$A)\ A' = A \quad B)A' = -A \quad C)AA^T = A^TA = I \quad D)A^m = 0$

44) If A is any square matrix is said to be Orthogonal matrix then [ ]

$A)\ A' = A \quad B)A' = -A \quad C)AA^T = A^TA = I \quad D)A^m = 0$

45) If A is any square matrix is said to be Nilpotent matrix then [ ]

$A)\ A' = A \quad B)A' = -A \quad C)AA^T = A^TA = I \quad D)A^m = 0$

46) If A is any square matrix is said to be Idempotent matrix then [ ]

$A)\ A^2 = I \quad B)A^2 = -A \quad C)A^2 = A \quad D)A^2 = -I$

47) If A is any square matrix is said to be Involuntary matrix then [ ]

$A)\ A^2 = I$ $B)A^2 = -A$ $C)A^2 = A$ $D)A^2 = -I$

48) Which of the following is orthogonal matrix [ ]

$A)\begin{bmatrix} -\frac{2}{3} & \frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & -\frac{2}{3} & -\frac{2}{3} \end{bmatrix}$ $B)\begin{bmatrix} -\frac{2}{3} & \frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & -\frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & -\frac{2}{3} & \frac{2}{3} \end{bmatrix}$ $C)\begin{bmatrix} -2/3 & 1/3 & 2/3 \\ 2/3 & 2/3 & 1/3 \\ -1/3 & -2/3 & -2/3 \end{bmatrix}$ $D)\begin{bmatrix} -2/3 & 1/3 & 2/3 \\ 2/3 & 2/3 & 1/3 \\ 1/3 & -2/3 & 2/3 \end{bmatrix}$

49) If A is Skew Hermitian matrix then iA is [ ]

A)Skew hermitian B) Unitary C) Hermitian D) orthogonal

50) Which of the following statement is false [ ]

A) Principal diagonal elements of Skew hermitian matrix are either zero or purely imaginary

B) Principal diagonal elements of hermitian matrix are real

C) Principal diagonal elements of Skew symmetric matrix are zero

D) Principal diagonal elements of orthogonal matrix are 1

51) $The\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix} are$_____ [ ]

A)1,6 B)2,5 C)4,3 D)0,7

52) $The\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix} are$_____ [ ]

A)-1,3,-2 B)-1,2,3 C)1,-3,-2 D) -1,-3,-2

53) $Sum\ of\ the\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$_____ [ ]

A)3 B)5 C)7 D)10

54) $The\ Eigen\ values\ of\ a\ matrix\ A = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix} are$_____ [ ]

A)2,3 B)1,4 C)5,0 D) None

55) The Eigen values of A and $A^T$are_____ [ ]

A)Not same B) same C)0,0,1 D) None

56)The product of the Eigen values of a matrix A is equal to _____ [ ]

A)A B) Adj (A) C)DetA D) None

57) If λ is an eigen value of non singular matrix A then |A| / λ is an Eigen value of _____ [ ]

$A)AdjA$ $B)A^{-1}$ $C)A^T$ D)none

58) $The\ Eigen\ values\ of\ a\ matrix\ A = \frac{1}{2}\begin{bmatrix} i & \sqrt{3} \\ \sqrt{3} & i \end{bmatrix} are$_____ [ ]

$A)\frac{i+\sqrt{3}}{2}, \frac{i-\sqrt{3}}{2}$ $B)\frac{i+\sqrt{2}}{2}, \frac{i-\sqrt{2}}{2}$ $C)\frac{i+1}{2}, \frac{i-1}{2}$ $D)None$

59) $The\ Product\ of\ the\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix} is$_____ [ ]

A)6 B)1 C)-6 D)None

60) The Eigen vectors corresponding to distinct Eigen values of a matrix are _____ [ ]

A)Linearly independent B)Linearly dependent C) cannot say D)none

61) If one of the Eigen values of A is Zero, then A is _____matrix [ ]

A) Singular B)non-singular C)symmetric D)non-symmetric

62) Write the symmetric matrix corresponding to the quadratic form $x^2+6xy+5y^2$ [ ]

$A)\begin{bmatrix}5 & 3\\ 3 & 1\end{bmatrix}$ $B)\begin{bmatrix}1 & 3\\ 3 & 5\end{bmatrix}$ $C)\begin{bmatrix}1 & 6\\ 6 & 5\end{bmatrix}$ D)None

63) If all The Eigen values of A are Non-zeros then A is [ ]

A)Singular B)non-singular C)symmetric D)non-symmetric

64) The Eigen vectors for distinct Eigen values of a Symmetric matrix are [ ]

A)Non-zero B)Linearly Independent C)Linearly Dependent D)Orthogonal

65) The Eigen values of the matrix A are 1,2,3 then product of the Eigen values of matrix $A^{-1}$is [ ]

A)6 B)1/6 C)-6 D)-1/6

66) The Eigen values of the matrix A are 1,2,3 then sum of the Eigen values of matrix $A^{-1}$ is [ ]

A)6/11 B)11/6 C)6 D)-1/6

67) If 2,3,4 are Eigen values of A then the Eigen values of A-3I are [ ]

A)-1,0,1 B)-1,-1,0 C)1,1,0 D)1,1,1

68) Geometric multiplicity is defined as [ ]

A)Total no. of Eigen values B)Total no. of Eigen vectors

C)Total no. of Linearly Independent eigenvectors D)Total no. of Linearly dependent vectors

69) The concept of Algebraic multiplicity will come at [ ]

A)Repeated Eigen value B) Repeated Eigen vector C) Distinct Eigen vector D)All

70)$The\ sum\ of\ the\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix}-1 & 2 & 3\\ 0 & 3 & 5\\ 0 & 0 & -2\end{bmatrix}\ is$_____ [ ]

A)6 B)1 C)-6 D)0

71) If the Matrix A is singular, then one of the Eigen values of A is _____ [ ]

A)0 B)1 C)2 D)3

72) If λ is the Eigen value of a non-singular matrix A. then the Eigen value of Adj (A) is_____ [ ]

A)λ B) $\frac{|A|}{\lambda}$ C) $\frac{1}{\lambda}$ D)None

73) The characteristic roots of a real symmetric matrix are_____ [ ]

A)Imaginary B) Real C)complex D)None

74) The matrix p which diagonalize a given matrix A is called_____ [ ]

A)Singular matrix B) Spectral matrix C) Modal matrix D) None

75) The diagonal matrix D obtained by diagonalization is called_____ [ ]

A)Singular matrix B) Spectral matrix C) Modal matrix D) None

76) If the Eigen values of A are 1,2,3 then the Eigen values of $A^3$ are _____ [ ]

A)1,2,3 B)1,4,9 C)1,8,27 D) None

77 If λ is an Eigen value of A, then Eigen values of $A^T$ is _____ [ ]

A)1+ λ B) λ C)$\frac{1}{\lambda}$ D) None

78) Nature of the quadratic form $x^2+4xy+6xz-y^2+2yz+4z^2$ is [ ]

A)Positive semi definite B) Indefinite C) Negative semi definite D) Negative definite

79) Symmetric matrix associated with the given quadratic form $4x^2-8xy+4xz+3y^2-6yz+z^2$ is [ ]

$A)\begin{bmatrix}4 & 4 & 2\\ 4 & 3 & -3\\ 2 & -3 & 1\end{bmatrix}$ $B)\begin{bmatrix}4 & -4 & 2\\ -4 & 3 & 3\\ 2 & 3 & 1\end{bmatrix}$ $C)\begin{bmatrix}4 & -4 & 2\\ -4 & 3 & -3\\ 2 & -3 & 1\end{bmatrix}$ $D)\begin{bmatrix}4 & -4 & 2\\ -4 & 3 & -3\\ 2 & -3 & -1\end{bmatrix}$

80) Eigen values of Idempotent matrix are [ ]

A)0,-1 B)0,1 C)0,0 D)-1,-1

81) $The\ product\ of\ the\ Eigen\ values\ of\ A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix} is$_____ [ ]

A)5 B)-25 C)6 D)-36

82) $The\ Eigen\ values\ of\ A = \begin{bmatrix} a & h & g \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix} are$_____ [ ]

A)a,b,c B)1/a,1/b,1/c C)-a,-b,-c D)-1/a,-1/b,-1/c

83) If the Eigen values of A are 1,1,2 then the Eigen values of $A^2$ are _____ [ ]

A)1,1,2 B)1,1,4 C)1,1,8 D) None

84) $The\ sum\ of eigen\ values\ \ a\ matrix\ A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix} is$_____ [ ]

A)1 B)5 C)6 D)7

85)The sum of eigen values a matrix A= is_____ [ ]

A)0 B)1 C)7 D)5

86) The eigen values of an unitary matrix have absolute value [ ]

A)2 B)-1 C)1 D)-2

87) $The\ eigen\ values\ of\ matrix\ are \begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$ [ ]

A)-2,9 B)2,-9 C)-2,-9 D)2,9

88) $The\ eigen\ values\ of\ matrix\ are \begin{bmatrix} 3i & 2+i \\ -2+i & -i \end{bmatrix}$ [ ]

A)4i,-2i B)-4i,-2i C)4i, 2i D)-4i, 2i

89) Eigen values of nilpotent matrix of order 2 are [ ]

A)0,-1 B)0,0 C)0,1 D)1,1

90) If 2 is an Eigen value of orthogonal matrix A of order 2 then another eigen value of A [ ]

A)-2 B)-1/2 C)1/2 D)0

91) If 1,3,-2 are the Eigen value of A then Eigen values of $3A^3+5A^2-6A+2I$are [ ]

A)-4,110,10 B)4,-110,10 C)4,110,10 D)4,110,-10

92) $The\ Product\ of\ the\ Eigen\ values\ of\ the\ matrix\ A = \begin{bmatrix} -3 & 2 & 5 \\ 0 & 3 & 1 \\ 0 & 0 & -3 \end{bmatrix} is$_____ [ ]

A)9 B)-9 C)27 D)-27

93) $The\ Eigen\ values\ of\ a\ matrix\ A = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix} are$_____ [ ]

A)0,1 B)0,3 C)1,3 D)1,9

94) If the Eigen values of A are 1,2,3 then the Eigen values of $A^{-1}$are_____ [ ]

A)1,2,3 B)1,1/2,1/3 C) -1,1/2,1/3 D)1,1/2,-1/3

95) The Eigen values of a real skew symmetric matrix are all [ ]

A)real B) zeros C) Either purely imaginary or zero D) none

96) *The Eigen values of a matrix* $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ *are* [ ]

A)1,1,1 B)0,0,1 C)0,0,2 D)0,0,3

97) The nature of the quadratic form $2x^2+2y^2+2z^2+2yz$ is [ ]

A)Positive definite B) Positive semi definite C) negative definite D) negative semi definite

98) If the Eigen values of A are 0,0,5 then the rank of the quadratic form is [ ]

A)1 B)2 C)3 D)None

99) If the eigen values of A are -1,-2,-3 then the nature of the quadratic form is [ ]

A)Positive definite B) Positive semi definite C) negative definite D) negative semi definite

100) If the Eigen values of A are 0,-2,-3 then the nature of the quadratic form is [ ]

A)Positive definite B) Positive semi definite C) negative definite D) negative semi definite

101) Find the orthogonal trajectories of the family of curves y=ax [ ]

A) $x^2+y^2=c^2$ B) x-y=c C)x+y=c D) $\frac{1}{x}+\frac{1}{y}=c$

102) Which of the following is the orthogonal trajectories of the family of curves $x^2+y^2=c^2$ [ ]

A) $x^2-y^2=c^2$ B) y=ax C)x+y=c D) $\frac{1}{x}+\frac{1}{y}=c$

103) Which of the following isthe orthogonal trajectories of the family of curves $ay^2=x^3$ [ ]

A) $x^2-y^2=c^2$ B) y=ax C) $\frac{x^2}{3c}+\frac{y^2}{2c}=1$ D) $\frac{1}{x}+\frac{1}{y}=c$

104) Which of the following isthe orthogonal trajectories of the family of parabolas through origin and foci on y axis [ ]

A) $x^2-y^2=c^2$ B) x+y=c C) $\frac{x^2}{2c}+\frac{y^2}{c}=1$ D) $\frac{1}{x}+\frac{1}{y}=c$

105) Which of the following isthe orthogonal trajectories of the family of circles $x^2+(y-c)^2=c^2$ [ ]

A) $x^2+y^2=cx$ B) y=ax C) x+y=c D) $\frac{1}{x}+\frac{1}{y}=c$

106) A curve which cuts every member of a given family of curves at …… is an orthogonal trajectory of the given family of curves [ ]

A) $0^o$ B) $45^o$ C) $90^o$ D) $60^o$

107) Which of the following isthe orthogonal trajectories of the family of curves $y^2=4a(x+a)$ [ ]

A) $x^2-y^2=c^2$ B) $x+y=c$ C) $\frac{x^2}{2c}+\frac{y^2}{c}=1$ D) $y^2=4a(x+a)$

108) Which of the following isthe orthogonal trajectories of the family of circles $x^{\frac{2}{3}}+y^{\frac{2}{3}}=a^{\frac{2}{3}}$ .where 'a' is the parameter [ ]

A) $x^2-y^2=c^2$ B) $x+y=c$ C) $\frac{x^2}{2c}+\frac{y^2}{c}=1$ D) $x^{\frac{4}{3}}-y^{\frac{4}{3}}=c$

109) Which of the following is the orthogonal trajectories of the family of curves $x^2+y^2+2fy+1=0$ [ ]

A) $x^2+y^2-cx=1$ B) $x+y=c$ C) $\frac{x^2}{2c}+\frac{y^2}{c}=1$ D) $y^2=4a(x+a)$

110) The Orthogonal Trajectories in polar form, replace $\frac{dr}{d\theta}$ with [ ]

A) $\frac{d\theta}{dr}$ B) $-\frac{d\theta}{dr}$ C) $-r^2\frac{dr}{d\theta}$ D) $-r^2\frac{d\theta}{dr}$

111) The Orthogonal Trajectories in Cartesian co-ordinates, replace $\frac{dy}{dx}$ with [ ]

A) $-\frac{dx}{dy}$ B) $\frac{dx}{dy}$ C) $-\frac{dy}{dx}$ D) $-x\frac{dx}{dy}$

112) Which of the following is the orthogonal trajectories of the family of cardioids $r=a(1-\cos\theta)$ [ ]

A) $r=a(1-\sin\theta)$ B) $r=c(1+\cos\theta)$ C) $r=a(1-\cos\theta)$ D) $r=a\cos\theta$

113) Which of the following isthe orthogonal trajectories of the family of curves $r^n\sin n\theta=a^n$ [ ]

A) $r^n\cos n\theta=1$ B) $\sin n\theta=a^n$ C) $r^n\cos n\theta=c^n$ d) $r^n\sin n\theta=a^n$

114) Which of the following isthe orthogonal trajectories of the family of curves $r=2a(\cos\theta+\sin\theta)$ [ ]

A) $r^n\cos n\theta=1$ B) $r=2a(\cos\theta+\sin\theta)$ C) $r^n\cos n\theta=c^n$ d) $r=c(\cos\theta-\sin\theta)$

115.Which of the following isthe orthogonal trajectories of the family of curves $r^n\cos\theta=a^n$ [ ]

A) $c=r\sin^n\theta$ B) $\sin n\theta=a^n$ C) $r^n\cos n\theta=c^n$ d) $r^n\sin n\theta=a^n$

116) Which of the following is an orthogonal trajectories of the given family of $r=c\sin\theta$ [ ]

A) $c=r\sin\ \theta$ B) $\sin n\theta=a^n$ C) $rc=\cos\theta$ d) $r\ \sin n\theta=a^n$

117) Which of the following is an orthogonal trajectories of the given family of $r\theta=a$, 'a' is a parameter [ ]

A) $r=ce^{\frac{\theta^2}{2}}$ B) $r^2=ce^{\frac{\theta^2}{2}}$ C) $r=ce^{\frac{\theta}{2}}$ D)None

118) Which of the following is an orthogonal trajectory of the given family of $r = a\theta$, 'a' is a parameter [ ]

A) $r = ce^{\frac{-\theta^2}{2}}$ B) $r^2 = ce^{\frac{\theta^2}{2}}$ C) $r = ce^{\frac{\theta}{2}}$ D)None

119) Which of the following is an orthogonal trajectories of the given family of $y = ax^n$ , 'a' is a parameter [ ]

A) $x^2$-$y^2$=$c^2$ B) y=ax C) x+y=c D) $x^2 + ny^2 = c^2$

120) A body kept in air with temperature $25^o$ C cools from $140^o$ to $80^o$ in 20 minutes. Find C? [ ]

A) log115 B) log105 C)1.024 D)1.345

121) If $\theta, \theta_0$ are temperature of the body, surrounding medium respectively then Newton's law is [ ]

A) $\frac{d\theta}{dt} \alpha (\theta - \theta_0)$ B) $\frac{d\theta}{dt} \alpha (\theta_0 + \theta_0)$ C) $\frac{dt}{d\theta} \alpha (\theta_0 + \theta_0)$ D) None

122) "The rate of change of the substance is directly proportional to the amount of substance present" is called [ ]

A) Law of natural growth or decay B) Newton's Law of heatingC) Newton's Law of cooling D) None

123) "The temperature of the body is directly proportional to the rate of change of temperature of the body and that of the surrounding medium" is called [ ]

A) Law of natural growth B) Law of natural decay C) Newton's Law of cooling D) None

124) If the rate of change of a quantity M is proportional to the quantity present at any time t, then for decay $\frac{dM}{dt} = ky$ [ ]

A) Here k is positive B) Here k is negative C) Here k is neither positive nor negative D) None

125) The rate of change of temperature of a body is proportional to [ ]

A) Temperature of the body B) Temperature of the surrounding medium C) Temperature of air D) None

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