

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

I B.Tech I Semester (MR15 Regulations) Online I Mid Examination  
Subject: Engineering Mathematics

MULTIPLE CHOICE QUESTIONS:

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 null matrix then Rank of A = [      ]  
a) 0                      b) 1                      c) 2                      d) None
3. If A is not null matrix then Rank of A = [      ]  
a) 0                      b) cannot be defined                      c)  $\geq 1$                       d) None
4. 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
5. Rank of  $\begin{bmatrix} 3 & 4 & 5 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$  is [      ]  
a) 1                      b) 2                      c) 3                      d) None
6. The necessary and sufficient condition that the system of equations  $AX = B$  is consistent is [      ]  
a)  $\rho[A/B] = \rho[A]$                       b)  $\rho[A/B] \neq \rho[A]$                       c)  $\rho[A/B] < \rho[A]$                       d) None
7. The system of equations  $AX = B$  has no solution if [      ]  
a)  $\rho[A/B] = \rho[A]$                       b)  $\rho[A/B] \neq \rho[A]$                       c)  $\rho[A/B] < \rho[A]$                       d) None
8. If n is the number of unknowns, r is rank of A, for the system  $AX = B$  has a unique solution if [      ]  
a)  $\rho[A/B] = \rho[A] = r = n$                       b)  $\rho[A/B] \neq \rho[A] = r > n$   
c)  $\rho[A/B] = \rho[A] = r < n$                       d) None
9. 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)  $\rho[A/B] = \rho[A] = r = n$       b)  $\rho[A/B] \neq \rho[A] = r > n$

c)  $\rho[A/B] = \rho[A] = r < n$       d) None

10. The order of  $A = \begin{bmatrix} 0 & 1 & 2 & 2 \\ 1 & 1 & 2 & 3 \\ 2 & 2 & 2 & 3 \\ 2 & 3 & 3 & 3 \end{bmatrix}$  is [      ]

a)  $4 \times 4$     b)  $4 \times 3$     c)  $5 \times 5$     d) None

11. The trace of the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 5 & 8 & 10 \end{bmatrix}$  is [      ]

a) 13      b) 14      c) **15**      d) None

12. 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

13. The system of equations  $x+y=2, 2x+2y=5$  has [      ]

a) **No solution**    b) infinite solutions    c) unique solution    d) None

14. 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)  $x=4, y=-5$**     c)  $x=1, y=2$       d)  $x=4, y=3$

15. The necessary and sufficient condition for existence of inverse of a matrix A is

a)  $|A| \neq 0$     b)  $|A| = 0$     c)  $|A| = -1$     d) none [      ]

16. If A is a matrix of order  $4 \times 5$  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

17. The rank of non singular matrix of order 2015 is \_\_\_\_\_

a) **2015** b) 2018    c) 2020      d) None

18. The determinant of an orthogonal matrix is \_\_\_\_\_ [      ]

a)  $\pm 1$     b)  $< 1$     c) 0      d) None

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

a) **1**    b) 2    c) 3    d) None

20. The system of equations  $x+2y=5$  ,  $-2x+ay=4$  are consistent if \_\_\_\_\_ [ ]

- a)a=-4      b)a=4      c) **a≠-4**      d) none

21. 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)  **$\leq \min\{\text{rank of A, rank of B}\}$**    d) None

22. If A is orthogonal matrix then  $A^{-1}$  equals \_\_\_\_\_ [ ]

- a)A      b) **$A^T$**       C) $A^2$       d)None

23. 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)  $\begin{bmatrix} 0 & -3 & -2 \\ 3 & 0 & -4 \\ 2 & 4 & 0 \end{bmatrix}$

24. If A be nxn matrix of rank 'n', then the rank of Adj A is \_\_\_\_\_ [ ]

- a)**n**      b)n-1      c)1      d) None

25. 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)**None**

26 Every unit matrix is \_\_\_\_\_ [ ]

- a) Diagonal matrix   b) Scalar matrix      c) **Both**      d) None

27 Every Scalar matrix is \_\_\_\_\_ [ ]

- a) **Diagonal matrix**   b) Unit matrix   c) Both      d) None

28 The system of equations  $x+y=2$ ,  $2x+2y=5$  has \_\_\_\_\_ [ ]

- a) **No solution**   b) infinite solutions   c) unique solution      d) None

29 The system of equations  $2x+3y=6$ ,  $4x+6y=12$  has \_\_\_\_\_ [ ]

- a) no solution      b) **infinite solutions**      c) unique solution      d) None

30 The determinant of unit matrix of order 23044 is \_\_\_\_\_ [ ]

- a) 23044      b) 24430      c) 30244      d) **1**

### Fill in the Blanks

1. The rank of a unit matrix of order 'n' is \_\_\_\_\_ n \_\_\_\_\_

2. The rank of the matrix  $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 2 & 6 \\ 2 & 1 & 3 \end{bmatrix}$  is \_\_\_\_\_ 1 \_\_\_\_\_

3. The system of equations  $AX=B$  is said to be consistent if \_\_\_\_\_  $\rho[A/B] = \rho[A]$  \_\_\_\_\_

4. The system of equations  $AX=B$  is said to have a unique solution if \_\_\_\_\_  $\rho[A/B] = \rho[A] = r = n$  \_\_\_\_\_

5. The rank of a non-singular matrix of order  $n$  is  $n$
6. The System of equations  $AX=B$  is said to have an infinite number of solutions if  $\rho[A/B] = \rho[A] = r < n$
7. 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 6
8. If the rank of coefficient matrix of four linear equations  $AX=0$  in four unknowns is 4 then the solution is Zero solution
9. If  $A$  be  $n \times n$  matrix of rank ' $n$ ', then rank of  $\text{Adj } A$  is  $n$
10. The rank of a matrix every element of which is unity is 1
11. If a square  $A$  can be expressed as a sum of Symmetric matrix  $p$  and skew symmetric matrix  $Q$  then  $P=$  Non-singular  $Q=$  Non-singular

12. If the rank of matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & x & 4 \\ 1 & -1 & 1 \end{bmatrix}$  is 3 then the value of  $x$  is 6

13. For the system  $AX = B$ ,  $\rho[A/B] \neq \rho[A]$  then the system has no solution.

14. For the system  $x+y+z=0, 3x+2y+3z=0, 5x+3y-7z=0$  has  $x=$  0,  $y=$  0,  $z=$  0 as a trivial solution.

15. For  $\begin{bmatrix} 1 & 2 & 3 & \vdots & 6 \\ 0 & 1 & 2 & \vdots & 3 \\ 0 & 0 & a-8 & \vdots & b-15 \end{bmatrix}$  if  $b \neq 15, a \neq 8$ , the system has unique solution.

16. In computing the inverse of a matrix  $A$ , if  $A=IA$ ,  $I$  the pre-factor Row transformations are used.

17. 27 If  $[A/B] = \begin{bmatrix} 1 & 2 & 3 & \vdots & 6 \\ 0 & 1 & 2 & \vdots & 3 \\ 0 & 0 & a-8 & \vdots & b-15 \end{bmatrix}$  and if  $a = 8, b = 15$ ,  $\rho[A/B]=$  2

18. 28 If  $[A/B] = \begin{bmatrix} 1 & 2 & 3 & \vdots & 6 \\ 0 & 1 & 2 & \vdots & 3 \\ 0 & 0 & a-8 & \vdots & b-15 \end{bmatrix}$  and if  $b \neq 15$ ,  $\rho[A/B]=$  3

19. If  $[A/B] = \begin{bmatrix} 1 & 2 & 3 & \vdots & 6 \\ 0 & 1 & 2 & \vdots & 3 \\ 0 & 0 & a-8 & \vdots & b-15 \end{bmatrix}$  and if  $a = 8, b \neq 15$ ,  $\rho[A/B]=$  3

20. In computing the inverse of a matrix  $A$ , if  $A=AI$ ,  $I$  the post-factor Column transformations are used.

21. If the rank of  $A = \begin{bmatrix} a & 1 & 0 \\ 0 & a & 1 \\ 1 & 0 & a \end{bmatrix}$  is 2 then  $a =$  -1

22. If  $A$  is a matrix of order  $30 \times 24$  such that every element is 3, then the rank of  $A$  is 1

23. If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  then  $\text{Adj } A =$   $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

24. The rank of non-singular matrix of order 23044 is 23044

25. The rank of  $A = \begin{bmatrix} 0 & 1 & -1 \\ 2 & 0 & 4 \\ 3 & -2 & 0 \end{bmatrix}$  is -----**3**-----

26. The non-trivial solution of equations  $AX=0$  will exist when  $\rho[A] < \text{No.of unknowns}$

27. If  $A$  is a square matrix, then symmetric part of the matrix  $A$  is  $1/2(A+A^T)$

28. If  $A$  is a square matrix, then skew symmetric part of the matrix  $A$  is

$1/2(A-A^T)$

29. The determinant of a  $A_{3 \times 3}$  is zero and determinant of a sub-matrix of order 2 is not equal to zero then the rank of  $A$  is **2**

30.  $\begin{vmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{vmatrix} = \underline{\mathbf{1}}$

### **True or False**

1. Every square matrix is a sum of symmetric and skew-symmetric [True / False]
2. Every unit matrix is square matrix [True / False]
3. Every scalar matrix is unit matrix [True / False]
4. Every scalar matrix is diagonal matrix [True / False]
5. Every unit matrix is diagonal matrix [True / False]
6. Every matrix will have a rank [True / False]
7.  $\rho[A] = 0$  when  $A$  is a non-zero matrix [True / False]
8.  $\rho[A] \leq 1$  when  $A$  is non-zero matrix [True / False]
9. Rank of the identity matrix  $I_n$  is  $(n + 1)$  [True / False]
10. Rank of the matrix is unique [True / False]
11. The rank of a non-singular matrix of order  $n$  is  $(n+1)$  [True / False]
12. If  $A$  is a matrix of order  $m \times n$  then  $\rho[A] \leq \max(m, n)$  [True / False]
13. Every unit matrix is scalar matrix [True / False]
14. The inverse of a non-singular symmetric matrix  $A$  is skew-symmetric [True / False]
15. If  $A, B$  are orthogonal matrices, each of order  $n$  then  $AB$  and  $BA$  are orthogonal matrices. [True / False]
16. The inverse of an orthogonal matrix is not orthogonal [True / False]
17. If  $A$  &  $B$  are invertible matrices of the same order then  $(AB)^{-1} = A^{-1}B^{-1}$  [True / False]
18. If  $A$  &  $B$  are invertible matrices of the same order then  $(A^T)^{-1} = (A^{-1})^T$  [True / False]
19. If  $A$  is symmetric then  $\text{Adj}A$  is orthogonal [True / False]
20. Rank of unit matrix of order 4 is 4 [True / False]
21. A square matrix  $A$  is an orthogonal matrix if  $(A^T)^{-1} = A^{-1}$  [True / False]
22. The product of two invertible matrices is necessarily invertible [True / False]
23. A square matrix is non-singular if and only if its columns are linearly dependent [True / False]
24. If  $I$  is a unit matrix of order  $n$  then  $|I| = 0$  [True / False]
25. A square matrix  $A$  is invertible if it is singular [True / False]
26. The matrix  $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$  is a skew-symmetric [True / False]
27. If  $A$  is symmetric matrix then  $KA$  is skew-symmetric [True / False]
28. If  $A$  is skew-symmetric matrix then  $KA$  is skew-symmetric [True / False]
29. A real matrix can be expressed as a sum of symmetric and orthogonal matrix [True / False]
30. In the doo-little's method all the upper triangular matrix diagonal elements are 1 [True / False]

## Match the following:

1. If A is any matrix of order  $m \times n$  then

- |    |                    |                 |
|----|--------------------|-----------------|
| a) | Square matrix      | (i) $m = 1$     |
| b) | Rectangular matrix | (ii) $n = 1$    |
| c) | Row matrix         | (iii) $n = 0$   |
| d) | Column matrix      | (iv) $m \neq n$ |
|    | (v) $m = 0$        |                 |
|    | (vi) $m = n$ .     |                 |

2. If A is any square matrix then

- |                          |                 |
|--------------------------|-----------------|
| a) Symmetric matrix      | (i) $A = A'$    |
| b) Skew-Symmetric matrix | (ii) $A' = -A$  |
| c) Orthogonal matrix     | (iii) $A' = A$  |
| d) Nilpotent matrix      | (iv) $A^m = 0$  |
|                          | (v) $A^2 = A$   |
|                          | (vi) $A = -A$ . |

3. If A is any square matrix then

- |                            |  |
|----------------------------|--|
| a) Idempotent matrix       | (i) Above the principal diagonal elements are zero |
| b) Involutory matrix       | (ii) $A' = -A$                                     |
| c) Lower triangular matrix | (iii) $A^2 = A$                                    |
| d) Upper triangular matrix | (iv) $A^2 = I$                                     |
|                            | (v) Below the principal diagonal elements are zero |
|                            | (vi) The principal diagonal elements are zero      |

4. Match the following

- |                         |                                |
|-------------------------|--------------------------------|
| a) Unique solution      | (i) $AX = B$ ( $B \neq 0$ )    |
| b) Infinite solutions   | (ii) $\rho[A/B] = \rho[A] = n$ |
| c) No solution          | (iii) $\rho[A/B] \neq \rho[A]$ |
| d) Homogeneous Equation | (iv) $\rho[A/B] = \rho[A] < n$ |
|                         | (v) $\rho[A/B] = \rho[A] > n$  |
|                         | (vi) $AX = B$ ( $B = 0$ ).     |

5. Match the following

- |                             |                                |
|-----------------------------|--------------------------------|
| a) Consistent               | (i) $AX = B$ ( $B \neq 0$ )    |
| b) Inconsistent             | (ii) $\rho[A/B] = \rho[A]$     |
| c) Non trivial solutions    | (iii) $\rho[A/B] \neq \rho[A]$ |
| d) Non-Homogeneous Equation | (iv) $\rho[A/B] = 0$           |
|                             | (v) $\rho[A/B] = \rho[A] < n$  |
|                             | (vi) $AX = B$ ( $B = 0$ ).     |

## SHORT ANSWER QUESTIONS

1. Define rank of a matrix
2. What are the elementary transformations?
3. Define Echelon form of a matrix
4. Define linearly dependent set of vectors
5. Define linearly independent set of vectors

6. If  $A$  be  $n \times n$  matrix of rank 'n', then what is the rank of  $\text{Adj } A$
7. What is the condition for consistent of the non homogeneous system  $AX=B$
8. When the non homogeneous system  $AX=B$  have unique solution
9. When the non homogeneous system  $AX=B$  have an infinite number of solutions
10. Define Symmetric matrix
11. Define Skew symmetric matrix
12. Define orthogonal matrix
13. What is the Rank of the Non-singular matrix of order  $n$
14. What is the use of Elementary Transformations?
15. Define square matrix
16. Define Rectangular matrix
17. Define Scalar matrix
18. Define unit matrix
19. Define diagonal matrix
20. Define Null matrix
21. Define Sub matrix
22. Define minor of matrix
23. Define equivalence of matrices
24. Define inverse of the matrix
25. Define Trace of the matrix
26. Define the Conjugate of the matrix
27. Define the Transpose of a matrix
28. Define the conjugate Transpose of a matrix
29. Define a Lower triangular matrix
30. Define an upper triangular matrix