Unit 1 mth174 mcqs for practice

Digital system design using verilog (Lovely Professional University)

Unit 1

SET-1(MCQs)

1.

. The matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 5 \end{pmatrix}$ is a

a) symmetric matrix
b) skew-symmetric matrix
c) diagonal matrix
d) none of these

2.

If A is a non-null square matrix then $A + A^T$ is a

a) symmetric matrix
b) skew-symmetric matrix
c) null matrix
d) none of these

3.

If $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$ then $(A^2)^T =$

a) $\begin{pmatrix} 0 & -1 \\ 1 & -1 \end{pmatrix}$
b) I_2
c) $2A$
d) none of these

4.

$(AB)^T$ is equal to

a) $A^T + B^T$
b) $A^T B^T$
c) $B^T A^T$
d) none of these

5.

If $A = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ then $A \cdot A^t =$

a) I_2
b) A
c) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
d) none of these

6.

If $A = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$ then $A^2 + 7I =$

a) O b) $2A$ c) $3A$ d) $5A$

(use cayley theorem A^2-5A+7I=O)

7.

$(2A+3B)^T$ is equal to

a) $2A+3B^T$ b) $2A^T+3B^T$

c) $4A^T+9B^T$ d) none of these

8.

If $\begin{pmatrix} 2 & k \\ 1 & 3 \end{pmatrix}\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}=\begin{pmatrix} 1 & 2 \\ -3 & 1 \end{pmatrix}$ then the value of k is

a) -5 b) 0 c) 5 d) -1

9.

The trace of $A=\begin{pmatrix} 3 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ is

a) 7 b) 5 c) 6 d) 4.

10.

The trace of A^T is same as

a) trace of A b) trace of A^{-1}

c) [trace of A]^T d) none of these

11.

For an orthogonal matrix A, A^{-1} is same as

a) A b) A^T c) $adj\,A$ d) none of these

[matrix A is said to be orthogonal if $A^{-1}=A^T$]

12.

For any nonsingular matrix A, $\left(A^T\right)^{-1}$ is same as

a) $\left(A^{-1}\right)^T$ b) A^T c) A d) none of these

13.

For any orthogonal matrix A, det A is equal to

a) 0 b) 1 c) ± 1 d) -1

14. If the order of matrix A is m x p. And the order of B is p x n. Then the order of AB is ?

A. n x p
B. m x p
C. m x n
D. n x m

15. • What is a, if

If $B = \begin{bmatrix} 1 & 4 \\ 2 & a \end{bmatrix}$ is a singular matrix ?

A. 5
B. 6
C. 7
D. 8

16. • If

$$A = \begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$$

then $|A| = ?$

A. 2
B. 3
C. 4
D. 5

17. • The matrix

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

is a ?

A. symmetric
B. skew-symmetric
C. hermitian
D. skew-hermitian

18. Transpose of a rectangular matrix is a

1. rectangular matrix
2. diagonal matrix
3. square matrix
4. scalar matrix
5.

19. Two matrices A and B are multiplied to get AB if

1. both are rectangular
2. both have different order
3. no of columns of A is equal to rows of B
4. no of rows of A is equal to no of columns of B

20. If |A| = 0, then A is

1. zero matrix
2. singular matrix
3. non-singular matrix
4. 0

21. If A is a symmetric matrix, then A^t =

1. A
2. |A|
3. 0
4. diagonal matrix

22.

If $\begin{bmatrix} x+3 & 1 \\ 2 & y+2 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix}$ then values of x and y are

(a) $x=1$ and $y=2$ (b) $x=-1$ and $y=-2$ (c) $x=2$ and $y=3$ (d) none of these.

SET-2

1. Transpose of a rectangular matrix is a
   a. rectangular matrix
   b. diagonal matrix
   c. square matrix
   d. scalar matrix
2. Transpose of a column matrix is

a. zero matrix
b. diagonal matrix
c. column matrix
d. row matrix

3. Two matrices A and B are multiplied to get AB if

a. both are rectangular
b. both have same order
c. no of columns of A is equal to rows of B
d. no of rows of A is equal to no of columns of B

4. If eigen values of A are 0, 1, 2, then A is

a. zero matrix
b. singular matrix
c. non-singular matrix
d. none of these

5. If A is a symmetric matrix, then A^t =
a. A
b. |A|
c. 0
d. diagonal matrix

6.Rank of $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ is

a. 1 b. 2 c. 3 d. none of these

7.Rank of $\begin{bmatrix} 1 & 3 & 1 \\ 0 & 6 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is

b. 1 b. 2 c. 3 d. none of these

8.Rank of an identity matrix of order 4X4 is

a. 2 b. 3 c. 4 d. 5

9.Rank of a scalar matrix of order 4X4 is

a. 2 b. 3 c. 4 d. 5

10.Rank of a matrix of order pXq is

a.)p b.) q c.) p or less than p d.) cannot say

11. v1=(4,2,1,3),v2=(6,3,4,7),v3=(2,1,0,1).

a. -4.v1+v2+5v3=0 b. v1+v2+5v3=0 c. v1-v2+5v3=0 d. none of these

12..(1,3,4,3),(1,3,2,3) and (1,3,4,1) are given vectors.

a. Vectors are Linearly independent.
b. Vectors are Linearly dependent.
c. Cannot say
d. None of these

13.v1=(1,2,0),v2=(2,0,1),v3=(6,4,3). Which of the following is correct

a. Vectors are Linearly independent.

b. Vectors are Linearly dependent.
c. Vectors are Linearly dependent and 2v1+3v2-v3=0
d. None of these

14.If A is a matrix of order 3×2 and B is a matrix of order 2×3,then what is the order of AB:
(a) 3×2 (b) 2×3 (c) 3×3 (d) 3×4

15.If $\begin{bmatrix} x+3 & 2y \\ x\text{-}1 & 4 \end{bmatrix} = \begin{bmatrix} 4 & 6 \\ 0 & 4 \end{bmatrix}$, then what is the value of x :
(a) 2 (b) 3 (c)5 (d) 1

16.If $A = \begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 6 \\ 3 & 5 \end{bmatrix}$.then value of 3A-2B is equal to :
(a) $A = \begin{bmatrix} 1 & 1 & 4 \\ 3 & 5 & 2 \\ 1 & 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 5 \\ -12 & -7 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 0 \\ -12 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 2 \\ -3 & -1 \end{bmatrix}$

17.Product of eigen value is equals to
(a)trace of matrix (b)determinant of matrix (c)rank of matrix (d)none

18

Which of the properties are true for matrix multiplication

a. Distributive
b. Commutative
c. both a and b
d. neither a nor b

19

Which of the operations can be valid with two matrices of different sizes?

a. addition
b. subtraction
c. multiplication
d. Division

20

Which of the following statements are true?

a. trace(A)=trace(A')
b. det(A)=det(A')
c. both a and b
d. neither a nor b

21.

Which of the statements are true?

a. If A is a symmetric matrix, inv(A) is also symmetric
b. det(inv(A)) = 1/det(A)
c. If A and B are invertible matrices, AB is an invertible matrix too.
d. all of the above

22

Which of the following options hold true?

a. inv(inv(A)) = A
b. inv(kA)=inv(A)/k
c. inv(A') = inv(A)'
d. all of the above

23

What is the rank of the matrix $\begin{bmatrix} 2 & -1 & 1 & -6 & 8 \\ 1 & -2 & -4 & 3 & -2 \\ -7 & 8 & 10 & 3 & -10 \\ 4 & -5 & -7 & 0 & 4 \end{bmatrix}$

a. 2
b. 3
c. 4
d. 5

24.

The vectors x1=$\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$, x2=$\begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$, x3=$\begin{pmatrix} 3 \\ 1 \\ 4 \end{pmatrix}$ are :

a. Linearly dependent
b. Linearly independent

25

The vectors x1=$\begin{pmatrix}1\\2\end{pmatrix}$, x2=$\begin{pmatrix}-5\\3\end{pmatrix}$ are :

a. Linearly dependent
b. Linearly independent

26

The number of non-zero rows in an echelon form is called?

a. reduced echelon form
b. rank of a matrix
c. conjugate of the matrix
d. cofactor of the matrix

27

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

a. 0
b. 2
c. 1
d. 3

28

The rank of $\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}$ is

a. 3
b. 2
c. 1
d. 0

29

5. Consider the following two statements:

I. The maximum number of linearly independent column vectors of a matrix A is called the rank of A.

II. If A is an n x n square matrix, it will be nonsingular is rank A = n.

With reference to the above statements, which of the following applies?

a. Both the statements are false2
b. Both the statements are true
c. I is true but II is false.
d. I is false but II is true

30

The Eigenvalues of a matrix $\begin{bmatrix} 2 & 7 \\ -1 & -6 \end{bmatrix}$ are

a. 3 and 0
b. -2 and 7
c. -5 and 1
d. 3 and -5

31

The Eigenvalues of $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ are

a. -1, 1 and 2
b. 1, 1 and -2
c. -1, -1 and 2
d. 1, 1 and 2

32

The Eigenvectors of $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ are

a. (1 1 1), (1 0 1) and (1 1 0)
b. (1 1 -1), (1 0 -1) and (1 1 0)
c. (-1 1 -1), (1 0 1) and (1 1 0)
d. (1 1 1), (-1 0 1) and (-1 1 0)

33

Indicate which of the statements are true?

a. If m is an Eigenvalue of A, the m is an Eigenvalue of A'

b. If m is an Eigenvalue of A, then 1/m is the Eigenvalue of inv(A)
c. both a and b
d. neither a nor b

Indicate which of the statements are true?

a. A singular matrix must have a zero Eigenvalue
b. A singular matrix must have a negative Eigenvalue
c. A singular matrix must have a complex Eigenvalue
d. (d) All of the above

35. To multiply a matrix by 2, multiply
(a) any row by 2 (b) every element by 2 (c) any column by 2 (d) none of these.

36. Matrix has a value. This statement is
(a) always true (b) depend upon the matrices (c) false (d) none of these.

37 The product of the Eigen values of $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 5 \\ 0 & 0 & 5 \end{bmatrix}$ is

(a) 10 (b) 20 (c) 30 (d) none of these

38. If two Eigen values of $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ are 2 and 13, then the third value is

(a) 0 (b) 3 (c) 2 (d) 4

39. The rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 4 & 6 \end{bmatrix}$ is

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

40.For any 2 x 2 matrix A, if A(Adj A)= $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A| =$

a) 0 b) 10 c) 20 d) 100

41.The eigen values of a matrix $\begin{bmatrix} 2 & 7 \\ -1 & -6 \end{bmatrix}$ are

a) 3 and 0 b) 3 and -7 c) -5 and 1 d) 3 and -5

42.The system of equations 3x + y +2z = 3, 2x – 3y –z = -3, x + 2y + z = 4 has the solution

a) 2, 1, -2 b) 1, 1, 1 c) 1, 4, -2 d) 1, 2, -1

43.If x1=(1,1,1,3), x2=(1,2,3,4) and x3=(2,3,4,7) are vectors ,Which of following is false:

a. X1,x2 and x3 are Linearly independent.
b. X1,x2 and x3 are Linearly dependent.

c. X1,x2 and x3 are Linearly dependent and x1+x2-x3=0.

d. X1,x2 and x3 are Linearly dependent and x1+x2=x3

44..The eigen values of A= $\begin{bmatrix} 1 & 1 & 3 \\ 0 & -3 & -3 \\ 0 & 0 & -4 \end{bmatrix}$ are

a. 1,-3,-4 b. 1,3,4 c. -1,3,4 d. 1,-3,4

45.If A= $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ and $\lambda = 2$ is eigen value of A, the eigen vector corresponding to $\lambda = 2$ is :

a. $[1\ -1\ 0]^t$ b. $[1\ 2\ 1]^t$ c. $[1\ 2\ 2]^t$ d. $[1\ -1\ 1]^t$

46.A matrix $A = [a_{ij}]$ is an upper triangular matrix if

a) it is a square matrix and $a_{ij} = 0, i < j$ b) it is a square matrix and $a_{ij} = 0, i > j$

c) it is not a square matrix and $a_{ij} = 0, i > j$ d) it is not a square matrix and $a_{ij} = 0, i < j$

47.The characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ is

a)$\lambda^3 - 20\lambda + 8 = 0$ b)$\lambda^3 + 20\lambda + 8 = 0$ c)$\lambda^3 - 20\lambda - 8 = 0$

Multiple Choice Questions.

Indicate the correct answer for each question by writing the corresponding letter from (a), (b), (c) *and* (d).

11. If **A** is a matrix such that there exists a square submatrix of order r which is non-singular and every square submatrix of order $r + 1$ or more is singular, then

(a) rank $\mathbf{A} = r + 1$ (b) rank $\mathbf{A} = r$ (c) rank $\mathbf{A} > r$ (d) rank $\mathbf{A} \geq r + 1$

12. Le $\mathbf{A} = [a_{ij}]_{m \times n}$ be a matrix such that $a_{ij} = 1$ for all i, j. Then

(a) rank $\mathbf{A} > 1$ (b) rank $\mathbf{A} = 1$ (c) rank $\mathbf{A} = m$ (d) rank $\mathbf{A} = n$

13. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ is

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

14. If **A** and **B** are two matrices such that rank of $\mathbf{A} = m$ and rank of $\mathbf{B} = n$, then

(a) rank $(\mathbf{A}\,\mathbf{B}) = m\,n$ (b) rank $(\mathbf{A}\,\mathbf{B}) \geq$ rank **A**

(c) rank $(\mathbf{A}\,\mathbf{B}) \geq$ rank **B** (d) rank $(\mathbf{A}\,\mathbf{B}) \leq$ min (rank **A**, rank **B**)

15. If **A** is an invertible matrix and **B** is a matrix, then

(a) rank $(\mathbf{A}\,\mathbf{B})$ = rank **A** (b) rank $(\mathbf{A}\,\mathbf{B})$ = rank **B**

(c) rank $(\mathbf{A}\,\mathbf{B}) >$ rank **A** (d) rank $(\mathbf{A}\,\mathbf{B}) >$ rank **B**

16. The rank of the matrix $\mathbf{A} = \begin{bmatrix} 1 & 2 & 0 & 0 \\ 2 & 3 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ is

(a) 0 (b) 1

(c) 2 (d) 3 **(Bundelkhand 2001; Meerut 2003)**

(a), (b), (c) and (d).

10. If λ is a characteristic root of a matrix A, then a characteristic root of A^{-1} is
    (a) $1/\lambda$ (b) λ
    (c) λ^2 (d) $1/\lambda^2$.

11. The eigenvalues of the matrix $A = \begin{bmatrix} a & h & g \\ 0 & b & 0 \\ 0 & c & c \end{bmatrix}$ are
    (a) a, h, g (b) a, h, c
    (c) a, g, c (d) a, b, c.

12. If λ is a characteristic root of the matrix A, then a characteristic root of the matrix $A + kI$ is
    (a) λ (b) $k + \lambda$
    (c) $k - \lambda$ (d) none of these.

13. The characteristic equation of $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ is
    (a) $\lambda^2 - 5\lambda + 7 = 0$ (b) $\lambda^2 - 3\lambda + 7 = 0$
    (c) $\lambda^2 - 2\lambda + 7 = 0$ (d) none of these.

1. For the matrix $P = \begin{bmatrix} 3 & -2 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, one of the eigenvalues is equal to -2.

Which of the following is an eigenvector?

(a) $\begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$ (b) $\begin{bmatrix} -3 \\ 2 \\ -1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$ (d) $\begin{bmatrix} 2 \\ 5 \\ 0 \end{bmatrix}$

2. Eigenvalues of a matrix $S = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ are 5 and 1. What are the eigenvalues of the matrix S^2?

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

3. The sum of eigenvalues of matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ is

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

4. The eigenvalues of the matrix $\begin{bmatrix} 2 & -1 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & -2 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$ are

(a) 2, −2, 1, −1 (b) 2, 3, −2, 4 (c) 2, 3, 1, 4 (d) none of these

5. The eigenvalues of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ are

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

6. The minimum and maximum eigenvalues of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are -2 and 6 respectively. What is the other eigenvalue?

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

7. If A be a 3×3 matrix with eigenvalues 1, -1, 0, then the determinant of $I + A^{100}$ is

(a) 6 (b) 4 (c) 9 (d) 100

8. The sum of the eigenvalues of the matrix $\begin{bmatrix} 3 & 4 \\ x & 1 \end{bmatrix}$ for real and negative value of x is

(a) greater than zero (b) less than zero (c) zero (d) dependent values of x.

9. A is a singular matrix of order 3 with eigenvalues 2 and 3. The third eigenvalue is

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

25. The number of independent eigenvectors to the matrix $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(a) 1 (b) 2 (c) 3 (d) zero.

26. The number of independent eigenvectors to the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

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

27. The sum of the eigenvalues of the matrix $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 1 & 4 & 1 & 2 \\ 2 & 1 & 3 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ is

(a) 9 (b) 8 (c) 10 (d) none of these.

13. For the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix}$, which of the following is correct ?

(a) $A^3 + 3A^2 - I = 0$ (b) $A^3 - 3A^2 - I = 0$

(c) $A^3 + 2A^2 - I = 0$ (d) $A^3 - A^2 + I = 0$