Unit 1 - Matrices and Determinants

Multiple Choice Questions

Question 1

The matrix A = $\begin{pmatrix} \sqrt{2} \\ 0 \\ 0 \end{pmatrix}$ is

a) Complex matrix
b) Column matrix
c) Real matrix
d) Both (b) and (c)

Answer: d

Question 2

$\begin{pmatrix} 1 & 0 \\ 2 & 0 \end{pmatrix}$ is

a) Real matrix
b) Second order matrix
c) Column matrix
d) Not a matrix

Answer: d

Question 3

If A = $\begin{pmatrix} -1 & 0 & 0 \\ 2 & 3 & 4 \\ -1 & 0 & -7 \end{pmatrix}$ and B = $\begin{pmatrix} -1 & 0 \\ -1 & -7 \end{pmatrix}$ then B is

a) Negative matrix
b) Sub matrix of A
c) Column matrix
d) None of these

Answer: b

Question 4

$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$ is a

a) Upper triangular matrix
b) Scalar matrix
c) Diagonal matrix
d) All of the above

Answer: d

Question 5

If $\begin{pmatrix} x & y \\ 2 & -1 \end{pmatrix} = \begin{pmatrix} 4 & x+y \\ -1 & -6 \end{pmatrix} + \begin{pmatrix} 11 & 1 \\ 3 & 1 \end{pmatrix}$ then

a) x = 1, y = 0
b) x = 1
c) x = 1, y = 1
d) None of the above

Answer: c

Question 6

If A and B are of the same order matrices then

a) A + B ≠ B + A
b) AB ≠ BA
c) A + B = B + A
d) None of the above

Answer: c

Question 7

Which one is not correct

a) $(A+B)^T = B^T + A^T$
b) $(A^T)^T = A$
c) $(AB)^T = A^T B^T$
d) AB ≠ BA

Answer: c

Question 8

If AB = AC then

a) B = C always
b) B = C may not be true
c) B = ACA^{-1}
d) None of the above

Answer: b

Question 9

If m × n is the order of matrix A and n × p is the order of matrix B and m ≠ p, then the order of BA is

a) m × p
b) p × n
c) n × p
d) Not defined

Answer: d

Question 10

If A is a square matrix then AA^T is

a) Symmetric
b) Singular matrix
c) Skew-symmetric
d) Non-singular matrix

Answer: a

Question 11

If A is a square matrix of order n then the order of A^3 is

a) n
b) n^3
c) n^2
d) None of these

Answer: a

Question 12

If A = $\begin{pmatrix} 2 & 6 \\ 3 & 4 \end{pmatrix}$, B = $\begin{pmatrix} 1 & -1 \\ 2 & 5 \end{pmatrix}$ then I - BA is

a) $\begin{pmatrix} 2 & -2 \\ 20 & -31 \end{pmatrix}$
b) $\begin{pmatrix} -1 & 2 \\ 19 & 32 \end{pmatrix}$
c) $\begin{pmatrix} 2 & -2 \\ -19 & -31 \end{pmatrix}$
d) $\begin{pmatrix} -2 & 2 \\ 19 & 31 \end{pmatrix}$

Answer: c

Question 13

The minor of -1 in $\begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & -1 & 2 \end{pmatrix}$ is

a) 13
b) 2
c) 1
d) 5

Answer: d

Question 14

The value of $\begin{vmatrix} -1 & 7 & 1 \\ 2 & -1 & 3 \\ 4 & -2 & 6 \end{vmatrix}$ is

a) 12
b) 0
c) 188
d) -8

Answer: b

Question 15

The co-factor of 0 in $\begin{pmatrix} 1 & 2 & 3 \\ -1 & 5 & 0 \\ 4 & 7 & -6 \end{pmatrix}$ is

a) 15
b) 1
c) -1
d) 0

Answer: b

Question 16

If AB = AC then B = C is true only when

a) A is singular
b) A is non-singular
c) A is unit matrix
d) Both (b) and (c)

Answer: d

Question 17

If A = $\begin{pmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{pmatrix}$ then AA^T is

a) Singular
b) Skew-symmetric
c) Symmetric
d) None of the above

Answer: c

Question 18

If A = $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$, B = $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$, C = $\begin{pmatrix} -2 & -4 \\ -3 & -5 \end{pmatrix}$ then 3A - 2B + 4C is

a) $\begin{pmatrix} -7 & 19 \\ -6 & -15 \end{pmatrix}$
b) $\begin{pmatrix} -7 & -19 \\ -6 & -15 \end{pmatrix}$
c) $\begin{pmatrix} 7 & 19 \\ -6 & -15 \end{pmatrix}$
d) None of the above

Answer: b

Question 19

If A = $\begin{pmatrix} 1 & -1 & 1 \\ 3 & 4 & 2 \end{pmatrix}$ then (A + A^T) is

a) Singular
b) Skew-symmetric
c) Symmetric
d) None of the above

Answer: c

Question 20

The value of $\begin{vmatrix} 1 & 2 & -3 \\ 2 & 4 & -6 \\ 0 & 0 & 0 \end{vmatrix}$ is

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

Answer: d

Question 21

The value of $\begin{vmatrix} -1 & 2 & -2 \\ 2 & 2 & 1 \\ 2 & -1 & -2 \end{vmatrix}$ is

a) -27
b) 21
c) 3
d) 27

Answer: d

Question 22

If $\begin{vmatrix} x+2 & 2x+3 & 1 \\ 1 & 1 & 1 \\ 2 & 3 & 7 \end{vmatrix} = 0$ then x =

a) 1
b) 3/7
c) -1
d) None of these

Answer: c

Question 23

For the system 2x + 3y = -4, x + y = -1 by Cramer's rule, Δ =

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

Answer: d

Question 24

For the system 4x - y = 2, x - 3y = -5, by Cramer's rule, Δ_1 =

a) -22
b) -11
c) 22
d) 11

Answer: b

Question 25

By Cramer's rule, for the system x + y = 1, x - z = 2, y + z = -1, Δ =

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

Answer: a

Question 26

By Cramer's rule, for the system x + y + z = 9, 2x - 3y + z = 13, 3x + 4y + 5z = 40, Δ_2 =

a) -12
b) -36
c) 12
d) 36

Answer: b

Question 27

If A and B are symmetric then AB - BA is

a) Symmetric
b) Singular
c) Skew-symmetric
d) Non-singular

Answer: c

Question 28

The value of $\begin{vmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{vmatrix}$ is

a) 0
b) -1
c) 1
d) None of the above

Answer: c

Question 29

If A = $\begin{pmatrix} 2 & 3 \\ 5 & -7 \end{pmatrix}$ then Adj A is

a) $\begin{pmatrix} -7 & -5 \\ -3 & 2 \end{pmatrix}$
b) $\begin{pmatrix} -7 & -3 \\ 5 & 2 \end{pmatrix}$
c) $\begin{pmatrix} -7 & -3 \\ -5 & 2 \end{pmatrix}$
d) $\begin{pmatrix} 7 & -3 \\ -5 & 2 \end{pmatrix}$

Answer: c

Question 30

If A = $\begin{pmatrix} 9 & 3 \\ 4 & 2 \end{pmatrix}$ then (Adj A)^T =

a) $\begin{pmatrix} 9 & 3 \\ 4 & 2 \end{pmatrix}$
b) $\begin{pmatrix} 2 & -3 \\ -4 & 9 \end{pmatrix}$
c) $\begin{pmatrix} -2 & -4 \\ -3 & 9 \end{pmatrix}$
d) $\begin{pmatrix} 2 & -4 \\ -3 & 9 \end{pmatrix}$

Answer: d

Question 31

If A = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ then Adj A =

a) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$
b) A^T
c) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
d) A

Answer: d

Question 32

The inverse of $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \end{pmatrix}$ is

a) $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \end{pmatrix}$

b) $\begin{pmatrix} 1 & 5 \\ 2 & 6 \\ 3 & 7 \\ 4 & 8 \end{pmatrix}$

c) $\begin{pmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \end{pmatrix}$

d) Not possible

Answer: d

Question 33

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

a) A

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

c) -A

d) Does not exist

Answer: d

Question 34

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

a) A

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

c) -A

d) Does not exist

Answer: a

Question 35

If B = A^{-1} and B^{-1} =

a) A

b) I

c) Adj A

d) BC = I

Answer: b

Question 36

If AA^T = I then A^T A =

a) A
b) A^{-1}
c) A^T
d) I

Answer: d

Question 37

If B = A^{-1} and C = A^T then

a) $B \neq C$
b) B = I
c) B = C
d) BC = I

Answer: c

Question 38

If A = $\begin{pmatrix} 1 & -1 \\ 2 & 2 \end{pmatrix}$ then

a) A^{-1} is singular
b) A^{-1} is non-singular
c) A^{-1} = A
d) A^{-1} does not exist

Answer: d

Question 39

If A = $\begin{pmatrix} 2 & 4 \\ 0 & 1 \end{pmatrix}$ then A^{-1} =

a) $\frac{1}{2}\begin{pmatrix} 1 & 0 \\ -4 & 2 \end{pmatrix}$
b) $\frac{1}{2}\begin{pmatrix} 1 & -4 \\ 0 & 2 \end{pmatrix}$
c) $\frac{1}{2}\begin{pmatrix} 1 & 0 \\ -4 & 2 \end{pmatrix}$
d) $\frac{1}{2}\begin{pmatrix} 1 & -4 \\ 0 & 2 \end{pmatrix}$

Answer: d

Question 40

If A = $\begin{pmatrix} -3 & 4 \\ -1 & 1 \end{pmatrix}$ then A^{-1} =

a) $\begin{pmatrix} -3 & 4 \\ -1 & 1 \end{pmatrix}$
b) $\begin{pmatrix} 1 & -4 \\ -1 & -3 \end{pmatrix}$
c) $\begin{pmatrix} 1 & -4 \\ 1 & -3 \end{pmatrix}$
d) $\begin{pmatrix} 1 & 1 \\ -4 & -3 \end{pmatrix}$

Answer: b

Question 41

$(A^{-1})^T$ =

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

Answer: a

Question 42

$(A^T)^2$ =

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

Answer: d

Question 43

If A and B are symmetric then A + B is

a) Symmetric
b) Singular
c) Skew-symmetric
d) None of these

Answer: a

Question 44

If A and B are skew-symmetric then A + B is

a) Symmetric
b) Singular
c) Skew-symmetric
d) None of these

Answer: c

Question 45

If A is symmetric then B'AB is

a) Skew-symmetric
b) Singular
c) Symmetric
d) None of these

Answer: c

Question 46

$(A^{-2})^{-1}$ =

a) $(A^{-2})^{-1}$
b) $(A^{-1})^{-2}$
c) $(A^{-1})^{-2}$
d) $(A^{T})^{2}$

Answer: d

Question 47

$A(\text{Adj } A)$ =

a) A
b) |A|I
c) |A|
d) None of these

Answer: b

Question 48

Characteristic equation of $\begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$ is

a) $\lambda^2 - 7\lambda - 4 = 0$
b) $\lambda^2 - 7\lambda + 6 = 0$
c) $-\lambda^2 - 7\lambda + 6 = 0$
d) $\lambda^2 + 7\lambda + 6 = 0$

Answer: b

Question 49

One of the eigen values of $\begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix}$ is $\frac{7+3\sqrt{5}}{2}$ then the other one is

a) $\frac{7-3\sqrt{5}}{2}$
b) $\frac{7-3\sqrt{5}}{2}$
c) $\frac{7+3\sqrt{5}}{2}$
d) None of these

Answer: b

Question 50

If A = $\begin{pmatrix} 0 & -1 \\ -2 & -1 \end{pmatrix}$, B = $\begin{pmatrix} -1 & -2 \\ 4 & -1 \end{pmatrix}$ then -3A + B =

a) $\begin{pmatrix} -4 & 1 \\ -2 & 2 \end{pmatrix}$
b) $\begin{pmatrix} -1 & 1 \\ -2 & 2 \end{pmatrix}$
c) $\begin{pmatrix} 1 & 5 \\ -2 & 2 \end{pmatrix}$
d) $\begin{pmatrix} -1 & -1 \\ -2 & -2 \end{pmatrix}$

Answer: b

Question 51

If $3\begin{pmatrix} x & y \\ 1 & 3 \end{pmatrix} = \begin{pmatrix} x & \\ -1 & 6 \end{pmatrix} + \begin{pmatrix} 4 & x+y \\ 4 & 3 \end{pmatrix}$ then the values of x and y are

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

Answer: b

Question 52

If A is a skew-symmetric matrix of order 3 then |A| =

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

Answer: b

Question 53

The eigen values of $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ are

a) 1, -1
b) -i, -i
c) i, i
d) i, -i

Answer: d

Question 54

If A = $\begin{pmatrix} 3 & 4 \\ 1 & -1 \end{pmatrix}$ then A^2 =

a) $\begin{pmatrix} 5 & -4 \\ 2 & -3 \end{pmatrix}$
b) $\begin{pmatrix} 5 & 8 \\ 4 & -3 \end{pmatrix}$
c) $\begin{pmatrix} 5 & -8 \\ 2 & 5 \end{pmatrix}$
d) $\begin{pmatrix} 5 & -8 \\ 2 & -3 \end{pmatrix}$

Answer: d

Question 55

If A is non-singular and AB = 0 then

a) B = O
b) B = A
c) B is non-singular
d) B is singular

Answer: d

Question 56

If A = O, AB = O then always implies that

a) AB = BA
b) AB < BA
c) AB ≠ BA
d) AB > BA

Answer: c

Question 57

If A = $\begin{pmatrix} 1 & 4 \\ -7 & 3 \end{pmatrix}$ then A^{-1} =

a) $\begin{pmatrix} 1 & 1 & 0 \\ 25 & 0 & 1 \end{pmatrix}$
b) $\frac{1}{25}\begin{pmatrix} 1 & -3 \\ 7 & 4 \end{pmatrix}$
c) $\frac{1}{25}\begin{pmatrix} 1 & 4 \\ -7 & 3 \end{pmatrix}$
d) $\frac{1}{25}\begin{pmatrix} 1 & 1 \\ 4 & 3 \\ -7 & 1 \end{pmatrix}$

Answer: b

Question 58

If A = $\begin{pmatrix} 1 & 0 \\ 2 & 4 \end{pmatrix}$ then eigen values of A are

a) -1, 4
b) 1, 4
c) 1, -4
d) None of these

Answer: b

Question 59

Eigen values of $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ are

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

Answer: d

Question 60

The value of $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix}$ is

a) a
b) c
c) b
d) 0

Answer: d

Question 61

If A = $\begin{pmatrix} 11 & -25 \\ 4 & -9 \end{pmatrix}$ then A^2 =

a) $\begin{pmatrix} 11 & -50 \\ 4 & 19 \end{pmatrix}$
b) $\begin{pmatrix} 21 & -50 \\ 8 & -19 \end{pmatrix}$
c) $\begin{pmatrix} 11 & -50 \\ -4 & -19 \end{pmatrix}$
d) $\begin{pmatrix} 11 & -50 \\ 8 & 19 \end{pmatrix}$

Answer: b

Question 62

For what value of x, the matrix $\begin{pmatrix} 4-x & 1 \\ -4 & -1-x \end{pmatrix}$ is singular?

a) 0, -3
b) 0, 2
c) 0, 3
d) None of these

Answer: c

Question 63

If A + B = $\begin{pmatrix} 1 & -1 \\ 3 & 0 \end{pmatrix}$ and A - B = $\begin{pmatrix} 3 & 1 \\ 1 & 4 \end{pmatrix}$ then B =

a) $\begin{pmatrix} 4 & 0 \\ 4 & 4 \end{pmatrix}$
b) $\begin{pmatrix} -2 & -2 \\ 2 & -4 \end{pmatrix}$
c) $\begin{pmatrix} 2 & 0 \\ 2 & 2 \end{pmatrix}$
d) $\begin{pmatrix} -1 & -1 \\ 1 & -2 \end{pmatrix}$

Answer: d

Question 64

If $(B'A')^{-1}C = I$ then C =

a) BA
b) $(AB)^{-1}$
c) $(BA)^{-1}$
d) AB

Answer: d

Question 65

If A is non-singular and symmetric then A^{-1} is

a) Skew-symmetric
b) Symmetric
c) Singular
d) None of these

Answer: b

Question 66

If 5x + 3y = 4, 7x + 2y = 5 then by Cramer's rule, Δ_x =

a) -11
b) -7
c) 53
d) -3

Answer: d

Question 67

If -1 is one of the eigen values of $\begin{pmatrix} 2 & 6 \\ 3 & 5 \end{pmatrix}$ then the other one is

a) -8
b) 1
c) 8
d) None of these

Answer: c

Question 68

The characteristic equation of $\begin{pmatrix} -1 & 3 \\ 1 & 1 \end{pmatrix}$ is

a) $\lambda^2 - 2\lambda - 4 = 0$
b) $\lambda^2 - 4\lambda = 0$
c) $\lambda^2 - 4 = 0$
d) None of these

Answer: c

Question 69

The eigen values of $\begin{pmatrix} -1 & 3 \\ 1 & 1 \end{pmatrix}$ are

a) $\lambda = \pm 2$
b) $\lambda = \pm 2i$
c) $\lambda = \pm 4$
d) None of these

Answer: a

Question 70

The characteristic equation of $\begin{pmatrix} 3 & 1 \\ 1 & 4 \end{pmatrix}$ is

a) $\lambda^2 - 7\lambda + 13 = 0$
b) $\lambda^2 - 7\lambda + 12 = 0$
c) $\lambda^2 - 7\lambda + 11 = 0$
d) $\lambda^2 + 7\lambda + 11 = 0$

Answer: b

Question 71

The characteristic equation of $\begin{pmatrix} 1 & 2 \\ -2 & 3 \end{pmatrix}$ is

a) $\lambda^2 - 3\lambda + 7 = 0$
b) $\lambda^2 - 4\lambda - 7 = 0$
c) $\lambda^2 - 4\lambda + 7 = 0$
d) $\lambda^2 - 4\lambda + 4 = 0$

Answer: c

Question 72

The eigen values of $\begin{pmatrix} -3 & 1 \\ -2 & 0 \end{pmatrix}$ are

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

Answer: d

Question 73

The value of $\begin{vmatrix} -1 & 3 \\ 1 & 1 \end{vmatrix}$ is

a) -2
b) 4
c) -4
d) None of these

Answer: c

Question 74

The value of $\begin{vmatrix} 1 & 2 & 0 \\ -1 & 4 & 1 \\ 3 & -5 & 6 \end{vmatrix}$ is

a) -47
b) 11
c) 47
d) 37

Answer: c

Question 75

The value of $\begin{vmatrix} 1 & 0 & 0 \\ 0 & -1 & 3 \\ 0 & 1 & 1 \end{vmatrix}$ is

a) -2
b) 4
c) -4
d) None of these

Answer: c

Key Answers Summary

Q	Answer	Q	Answer	Q	Answer	Q	Answer	Q	Answer
1	d	11	a	21	d	31	d	41	d
2	d	12	c	22	c	32	d	42	d
3	b	13	d	23	d	33	d	43	a
4	d	14	b	24	b	34	a	44	c
5	c	15	b	25	a	35	b	45	c
6	c	16	d	26	b	36	d	46	d
7	c	17	c	27	c	37	c	47	b
8	b	18	b	28	c	38	d	48	b
9	d	19	c	29	c	39	d	49	b
10	a	20	d	30	d	40	b	50	b
51	b	56	c	61	b	66	d	71	c
52	b	57	b	62	c	67	c	72	d
53	d	58	b	63	d	68	c	73	c
54	d	59	d	64	d	69	a	74	c
55	d	60	d	65	b	70	b	75	c

Topics Covered

This Unit 1 covers **Matrices and Determinants**, which are fundamental concepts in engineering mathematics. The MCQs test knowledge on:

- **Matrix Types & Properties**: Complex matrices, real matrices, column matrices, symmetric and skew-symmetric matrices
- **Matrix Operations**: Addition, multiplication, transpose operations
- **Determinants**: Calculation of determinants, minors, and cofactors
- **Special Matrices**: Triangular matrices, scalar matrices, diagonal matrices, identity matrices
- **Matrix Algebra**: Singular and non-singular matrices, inverse matrices, adjugate matrices
- **Cramer's Rule**: Solving systems of linear equations
- **Eigenvalues & Eigenvectors**: Characteristic equations and eigen value calculations
- **Advanced Properties**: Matrix rank, invertibility conditions, and transformations

These concepts are essential for solving engineering problems involving linear transformations, system solutions, and computational mathematics.