Subject: - Basic Mathematics

(22103)

SYLLABUS

Chapter No.	Name of Chapter	Marks with Option
1	Logarithm	**02**
2	Determinants	**06**
3	Matrices	**14**
4	Partial Fractions	**08**
5	Trigonometric ratios of Compound, Allied, Multiple and Sub-Multiple angles	**14**
6	Factorization and De-factorization Formulae	**08**
7	Inverse Trigonometric Ratios	**08**
8	Straight Line	**12**
9	Mensuration	**10**
10	Measures of Dispersion	**20**
	Total Marks: -	**102**

BOARD THEORY PAPER PATTERN FOR BMS (22103)

Q.1		**Attempt any FIVE** **5*2=10**
	a)	Logarithm
	b)	Determinants
	c)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles.
	d)	Mensuration
	e)	Mensuration
	f)	Measures of Dispersion
	g)	Measures of Dispersion
Q.2		**Attempt any THREE** **3*4=12**
	a)	Matrices

	b)	Partial Fractions
	c)	Determinants
	d)	Measures of Dispersion
Q.3		**Attempt any THREE** **3*4=12**
	a)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles
	b)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles
	c)	Factorization and De-factorization Formulae
	d)	Inverse Trigonometric Ratios
Q.4		**Attempt any THREE** **3*4=12**
	a)	Matrices
	b)	Partial Fractions
	c)	Factorization and De-factorization Formulae
	d)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles
	e)	Inverse Trigonometric Ratios
Q.5		**Attempt any TWO** **2*6=12**
	a)	**i)** Straight Line
		ii) Straight Line

	b)	**i)** Straight Line
		ii) Straight Line
	c)	**i)** Mensuration
		ii) Mensuration
Q.6		**Attempt any TWO** **2*6=12**
	a)	Measures of Dispersion
	b)	**i)** Measures of Dispersion
		ii) Measures of Dispersion
	c)	Matrices

CLASS TEST - I

PAPER PATTERN

COURSE: - Basic Mathematics (22103)

PROGRAMME: - All

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	**Logarithm**	**CO-103.01**
	Determinants	
	Matrices	
	Partial Fractions	
2	**Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles**	**CO-103.02**

Q.1	**Attempt any FOUR** **4*2=8Marks**	Course Outcome (CO)
a)	Determinants	CO-103.01
b)	Determinants	CO-103.01
c)	Matrices	CO-103.01
d)	Partial Fractions	CO-103.01
e)	Logarithm	CO-103.01
f)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles	CO-103.02
Q.2	**Attempt any THREE** **3*4=12 Marks**	
a)	Partial Fractions	CO-103.01

b)	Determinants	CO-103.01
c)	Matrices	CO-103.01
d)	Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles	CO-103.02

CLASS TEST - II

PAPER PATTERN

COURSE: - Basic Mathematics (22103)

PROGRAMME: - All

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
2	**Trigonometric Ratios of Compound, Allied, Multiple and Sub-Multiple angles**	**CO-103.02**
	Factorization and De-factorization Formulae	
	Inverse Trigonometric Ratios	
3	**Straight Line**	**CO-103.03**
4	**Mensuration**	**CO-103.04**
5	**Measures of Dispersion**	**CO-103.05**

Q.1	**Attempt any FOUR** **4*2=8Marks**	Course Outcome (CO)
a)	Factorization and De-factorization Formulae	CO-103.02
b)	Straight Line	CO-103.03
c)	Mensuration	CO-103.04
d)	Mensuration	CO-103.04
e)	Measures of Dispersion	CO-103.05
f)	Measures of Dispersion	CO-103.05
Q.2	**Attempt any THREE** **3*4=12 Marks**	
a)	Inverse Trigonometric Ratios	CO-103.02
b)	Straight Line	CO-103.03

c)	Mensuration	CO-103.04
d)	Measures of Dispersion	CO-103.05

COURSE OUTCOME

(CO)

COURSE: - Basic Mathematics (22103)

PROGRAMME: - All

CO. NO.	Course Outcome
CO- 103.01	Apply the concept of algebra to solve engineering related problems.
CO- 103.02	Utilize basic concepts of trigonometry to solve elementary engineering problems.
CO- 103.03	Solve basic engineering problems under given conditions of straight line.
CO- 103.04	Solve the problems based on measurement of regular closed figures and regular solids.
CO- 103.05	Use basic concepts of statistics to solve engineering related problems.

1. Logarithm

Position in Question Paper **Total Marks-02**

Q.1. a) 2-Marks.

Descriptive Question

Definition:

The **logarithm** is the inverse function to exponentiation. That **means** the **logarithm** of a given number x is the exponent to which another fixed number, the base b, must be raised, to produce that number x.

The logarithm of x to *base* b is denoted as $\log_b(x)$, or without parentheses, $\log_b x$, or even without the explicit base, $\log x$, when no confusion is possible, or when the base does not matter.

$log_a\, y = x$ if and only if $a^x = y$ and $y > 0, a > 0$ and $a \neq 1$

For example, $\log_2 64 = 6$, as $2^6 = 64$

Basic Properties of Logarithm

i) $\log_b 1 = 0\,; \log_2 1 = 0$

ii) $\log_m m = 1; \log_n n = 1$

Laws of Logarithm

	Formula	**Example**
i) Product	$\log_b xy$ $= \log_b x + \log_b y$	$\log_3 243 = \log_3 9 + \log_3 27$
ii) Quotient	$\log_b \frac{x}{y}$ $= \log_b x - \log_b y$	$\log_3 \frac{64}{4} = \log_3 64 - \log_3 4$ **Corollary** $\log_a \left(\frac{1}{n}\right) = -\log_a n$
iii) Power	$\log_b x^p = p \log_b x$	$\log_2 64 = \log_2 2^6 = 6 \log_2 2$ $= 6$

	$\log_b \sqrt[p]{x} = \frac{\log_b x}{p}$	$\log_{10}\sqrt{1000} = \frac{1}{2}\log_{10} 1000 = \frac{3}{2} = 1.5$

Important

i) $\log_a a^x = x$
ii) $\log_{10} 10^x = x$
iii) $\log_e e^x = x$
iv) $a^{\log_a x} = x$
v) $10^{\log_{10} x} = x$
vi) $e^{\log_e x} = x$

Q.1) Evaluate

a) $\log_3 81$ **W-17, W-18**
b) $\log_{10} 0.01$
c) $\log_8 \left(\frac{1}{8}\right)$
d) $\log_2 \sqrt{2}$
e) $\log_{48}(4\sqrt{3})$
f) $\log_{81} 27$
g) $\log_{2\sqrt{3}} 12$

Q.2) Evaluate

a) $3^{-2\log_3 5}$
b) $4^{2\log_2 3}$
c) $12^{\log_{2\sqrt{3}} 5}$
d) $(625)^{\log_5 7}$

Q.3) Find the value of

a) $\log\left(\frac{225}{32}\right) - \log\left(\frac{25}{81}\right) + \log\left(\frac{64}{729}\right)$
b) $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$ **S-18**
c) $\log\left(\frac{9}{14}\right) - \log\left(\frac{15}{16}\right) + \log\left(\frac{35}{24}\right)$
d) $2\log\left(\frac{3}{4}\right) + \log\left(13\frac{1}{3}\right) - \log\left(7\frac{1}{2}\right)$
e) $\log\left(\frac{145}{8}\right) - 3\log\frac{3}{2} + \log\left(\frac{54}{29}\right)$

Q.4) Solve for x

a) $\log_3(x+6) = 2$ **W-19**

b) $\log(x+3) + \log(x-3) = \log 27$

c) $\log_x 4 + \log_x 16 + \log_x 64 = 12$

d) $\log_{32} x = -\frac{3}{5}$

e) $\frac{(4\log 3)\,(\log x)}{\log 9} = \log 27$

f) $\log_{49}[\log_2(5x-2)] = \frac{1}{2}$

Change of Base Rule

i) $\log_b x = \frac{\log_a x}{\log_a b}$, x≠1, b≠1, x and b are positive real numbers

ii) $\log_b x = \frac{\log x}{\log b}$

iii) $\log_b a = \frac{1}{\log_a b}$ OR $\log_b a \; X \log_a b = 1$

Corollary

$\log_{a^n} x^n = \log_a x$

Q.5) Solve for x

a) $\log_2 x - \log_4 x = 2$

b) $\log_2 x + \log_4 x = 2$

c) If $\log_2 x + \log_8 x + \log_{16} x = \frac{95}{12}$, then find x

Q.6) Prove the following

a) $\frac{1}{\log_3 6} + \frac{1}{\log_8 6} + \frac{1}{\log_9 6} = 3$ **S-19**

b) $\log\left(\frac{p^2}{qr}\right) + \log\left(\frac{q^2}{rp}\right) + \log\left(\frac{r^2}{pq}\right) = 0$

c) $\log(\log x^7) - \log(\log x^3) = \log\left(\frac{7}{3}\right)$

d) $\log(1+2+3) = \log 1 + \log 2 + \log 3$

e) $\frac{1}{\log_b a} + \frac{1}{\log_c a} = \frac{1}{\log_{bc} a}$

f) $\frac{1}{\log_{bc} a + 1} + \frac{1}{\log_{ac} b + 1} + \frac{1}{\log_{ab} c + 1} = 2$

g) $7\log\left(\frac{16}{15}\right) - 5\log\left(\frac{24}{25}\right) + 3\log\left(\frac{81}{80}\right) = \log 2$

h) $\frac{1}{\log_a abc} + \frac{1}{\log_b abc} + \frac{1}{\log_c abc} = 1$

Q.7) Simplify the following

a) $\frac{1}{\log_5 10} + \frac{1}{\log_{20} 10}$

b) $2^{3\log_2 3} + 12^{\log_{2\sqrt{3}} 10}$

c) $\frac{1}{\log_8 2} + \frac{1}{\log_4 2}$

MCQ Question

(Total number of Question=Marks*3=2*3=6)

Note: Correct answer is marked with **bold.**

1. The logarithms having base 10 are called

a) Pure logarithms
c) Natural logarithms
b) Common logarithms
d) Infinite logarithms

2. The logarithms having base e are called

a) Pure logarithms
c) Natural logarithms
b) Common logarithms
d) Infinite logarithms

3. $\log_a\left(\frac{m}{n}\right)$ equals to

a) $\log_a m + \log_a n$
b) $\boldsymbol{\log_a m - \log_a n}$
c) $n\log_a m$
d) $\frac{\log_a m}{\log_a n}$

4. $\log_a(mXn)$ equals to

a) $\boldsymbol{\log_a m + \log_a n}$
b) $\log_a m - \log_a n$
c) $n\log_a m$
d) $\frac{\log_a m}{\log_a n}$

5. If $a^x = y$, then

a) $a = \log_x y$
c) $\boldsymbol{x = \log_a y}$
b) $x = \log_y a$
d) $a = \log_y x$

6. $10^{-3} = 0.001$ can be written in the form of logarithm as

a) $\log 1 = -3$
c) $\log 3 = -0.001$
b) $\log 0.001 = 3$
d) $\boldsymbol{\log 0.001 = -3}$

7. The types of logarithms are

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

8. $10^2 = 100$ can be written in the form of logarithm as

a) $\boldsymbol{\log 100 = 2}$
b) $\log 2 = 100$

c) $\log 2^{100}$ d) $\dfrac{\log 2}{\log 100}$

9. The relation $y = \log_z x$ implies

a) $x^y = z$ c) $x^z = y$

b) $\mathbf{z^y = x}$ d) $y^z = x$

10. Which of the following statements is not correct?

a) $\log_{10} 10 = 1$ c) $\log_{10} 1 = 0$

b) $\mathbf{\log(2+3) = \log(2X3)}$ d) $\log(1+2+3) = \log 1 + \log 2 + \log 3$

11. $\frac{\log\sqrt{8}}{\log 8}$ is equal to

a) $\dfrac{1}{6}$ **c)** $\mathbf{\dfrac{1}{2}}$

b) $\dfrac{1}{4}$ d) $\dfrac{1}{8}$

12. The value of $\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}$ is

a) 0 c) 5

b) **1** d) 60

13. If $\log_x\left(\frac{9}{16}\right) = \frac{-1}{2}$, then x is equal to

a) $\dfrac{-3}{4}$ b) $\dfrac{3}{4}$

c) $\dfrac{81}{256}$ **d)** $\mathbf{\dfrac{256}{81}}$

14. The value of $\log_2 16$ is

a) $\dfrac{1}{8}$ **b)** **4**

c) 8 d) 16

15. The value of $\log_5 \frac{(125)(635)}{25}$ is equal to

a) 725 c) 3125

b) **5** d) 6

16. Determine the value of $\log_{3\sqrt{2}}\left(\frac{1}{18}\right)$ is

a) 2 **b)** **-2**

c) $\sqrt{2}$ d) $\sqrt{3}$

17. The value of $\log_{10}(0.0001)$ is

a) $\dfrac{1}{4}$ b) $\dfrac{-1}{4}$

c) **-4** d) 4

18. What is the value of $[\log_{10}(5\log_{10}100)]^2$

a) **1** c) 10

b) 2 d) 25

19. If $\log_{10000} x = \frac{-1}{4}$, then the value of x is

a) $\frac{1}{10}$ c) $\frac{1}{1000}$

b) $\frac{1}{100}$ d) $\frac{1}{10000}$

20. The value of $\frac{6\log_{10}1000}{3\log_{10}100}$

a) 0 c) 2

b) 1 **d)** **3**

21. If $\log_2[\log_3(\log_2 x)] = 1$, then x is equal to

a) 0 c) 128

b) 12 **d)** **512**

22. What is the value of the following expression?

$\log\left(\frac{9}{14}\right) - \log\left(\frac{15}{16}\right) + \log\left(\frac{35}{24}\right)$

a) **0** c) 2

b) 1 d) 3

23. $2\log_{10}5 + \log_{10}8 - \frac{1}{4}\log_{10}4 = ?$

a) **2** b) 4

c) $2 - 2\log_{10}2$ d) $4 - 4\log_{10}2$

24. If $\log_{10}125 + \log_{10}8 = x$, then x is equal to

a) $\frac{1}{3}$ b) 0.064

c) -3 **d)** **3**

25. If $\log_5(x^2 + x) = \log_5(x + 1) = 2$, then the value of x is

a) 5 **c)** **25**

b) 10 d) 32

26. $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ac}\right) + \log\left(\frac{c^2}{ab}\right)$ is equal to

a) **0** c) 2

b) 1 d) Abc

27. $\frac{1}{\log_a b} X \frac{1}{\log_b c} X \frac{1}{\log_c a}$ is equal to

a) a + b +c c) 0

b) abc **d)** **1**

28. $\frac{1}{(\log_a bc)+1}+\frac{1}{(\log_b ca)+1}+\frac{1}{(\log_c ab)+1}$

a) **1** b) $\frac{3}{2}$

c) 2 d) 3

29. If $\log x - 5\log 3 = -2$, then x equals

a) 0.8 c) 1.25

b) 0.81 **d)** **2.43**

30. If $\log_3 x + \log_9 x^2 + \log_{27} x^3 = 9$, then x equals to

a) 3 **c)** **27**

b) 9 d) None of these

31. The value of $\log_5\left(\frac{1}{125}\right)$ is

a) $\frac{-1}{3}$ c) $\frac{1}{3}$

b) **-3** d) 3

32. If $\log_x 4 = \frac{1}{4}$, the x is equal to

a) **256** c) 64

b) 128 d) 16

33. The value of $\log_2(\log_5 625)$ is

a) 10 c) 4

b) **2** d) 5

34. The value of $\log_{343} 7$ is

a) $\frac{-1}{3}$ **c)** $\mathbf{\frac{1}{3}}$

b) -3 d) 3

35. If $\log_{32} x = 0.8$, then x equals to

a) 12.8 **c)** **16**

b) 10 d) 25.6

36. $36^{(\log_6 4)}$

a) 4 b) 8

c) 16 d) 64

2. Determinant

Position in Question Paper **Total Marks-06**

Q.1. b) 2-Marks.
Q.2. c) 4-Marks.

Descriptive Question

Definition:

An expression expressed in equal number of rows and columns and put between two vertical lines is called as determinant. Determinants are denoted by D or Δ(delta).

Determinant of order 2X2

D or $\Delta = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$ = ad-bc

Determinant of order 3X3

D or $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

D or $\Delta = a_{11}\begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} - a_{12}\begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix} + a_{13}\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$

Q.1) Evaluate or Expand or Find the value of determinant

a) $\begin{vmatrix} 3 & -5 & -1 \\ 1 & 3 & 5 \\ -5 & 1 & 3 \end{vmatrix}$ **(W-12)**

b) $\begin{vmatrix} 2 & 3 & 5 \\ 1 & 4 & 2 \\ 3 & 1 & 1 \end{vmatrix}$ **(W-14)**

Q.2) Solve or Find 'x' if

a) $\begin{vmatrix} 4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & x \end{vmatrix} = 0$ **(S-15, W-15, S-19)**

b) $\begin{vmatrix} 1 & x & x^2 \\ 1 & 2 & 4 \\ 1 & 3 & 9 \end{vmatrix} = 0$ **(S-16)**

c) $\begin{vmatrix} 4 & 3 & 9 \\ 3 & 2 & 7 \\ 1 & 4 & x \end{vmatrix} = 0$ **(W-16)**

d) $\begin{vmatrix} 1 & 1 & 1 \\ 3 & x & 3 \\ 1 & x & 2 \end{vmatrix} = 0$ **(S-17)**

e) $\begin{vmatrix} x & 0 & 0 \\ 3 & -2 & 1 \\ -2 & -4 & 1 \end{vmatrix} = 0$ **(S-18)**

Q.3) Find K if $\begin{vmatrix} 2 & -k & 7 \\ 3 & -4 & 13 \\ 8 & -11 & 33 \end{vmatrix} = 0$ **(S-13)**

Q.4) Find the value of P if $\begin{vmatrix} P & 4 & -4 \\ 3 & -2 & 1 \\ -2 & -4 & 1 \end{vmatrix} = 0$ **(W-17, S-18, S-19)**

Applications of Determinant

I) Cramer's Rule

Q.5) Solve the following equations by Cramer's Rule

a) $x + y + z = 3;\quad x - y + z = 1;\quad x + y - 2z = 0.$ **(S-17, S-19)**

b) $x - y - 2z = 1;\quad 2x + 3y + 4z = 4;\quad 3x - 2y - 6z = 5.$ **(W-17)**

c) $3x + 3y - z = 11;\quad 2x - y + 2z = 9;\quad 4x + 3y + 2z = 25.$ **(W-17)**

d) $3x + y + z = 4;\quad 2x - 3y + z = 7;\quad x + y + 3z = 6.$ **(S-18)**

e) $x + y + z = 2;\quad y + z = 1;\quad x + z = 3.$ **(W-18)**

f) $x + y = 0;\quad y + z = 2;\quad x + z = 4.$ **(W-18)**

g) $x + z = 4;\quad y + z = 2;\quad x + y = 0.$ **(S-19)**

Q.6) The voltages in an electric circuit are related by following questions.
$V_1 + V_2 + V_3 = 9;\quad V_1 - V_2 + V_3 = 3;\quad V_1 + V_2 - V_3 = 1.$ Find V_1, V_2 and V_3. **(S-18)**

Q.7) Following equations are obtained as a result of an experiment.
$P_1 + P_2 - P_3 = 0;\quad 2P_1 + P_2 + P_3 = 26;\quad P_2 + P_3 = 14.$
Find P_1, P_2 and P_3 by using Cramer's Rule. **(S.Q.P)**

II) Area of triangle

Q.8) Find the area of the triangle whose vertices are

a) $(4,7), (1,3) and\ (5,1)$ **(S.Q.P)**

b) $(3,1),(-1,3) and\ (-3,-2)$ **(S-18)**

c) $(4,3),(1,4) and\ (2,3)$ **(W-18)**

d) $(-3,1),(1,-3) and\ (2,3)$ **(W-18)**

Collinearity of Points

Q.9) Show that the points $(8,1),(3,-4)$and $(2,-5)$are collinear using determinant. **(W-17)**

Q.10) Show that the points $(2,3),(-1,0)$and $(4,5)$are collinear using determinant.

Q.11) Show that the points $(3,1),(-1,3)$and $(-3,2)$are collinear using determinant.

MCQ Question

(Total number of Question=Marks*3=6*3=18)

Note: Correct answer is marked with **bold**

1. If $\begin{vmatrix} 2x & -1 \\ 4 & 2 \end{vmatrix} = \begin{vmatrix} 3 & 0 \\ 2 & 1 \end{vmatrix}$, then x is

a) 3

b) $\frac{2}{3}$

c) $\frac{3}{2}$

d) $\mathbf{\frac{-1}{4}}$

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

a) **-7**

c) 8

b) 7

d) 10

3. Evaluate the determinant $\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$

a) **46**

c) 23

b) -46

d) None of these

4. Find the values of x such that the points (0, 2), (1, x) and (3, 1) are collinear

a) $\mathbf{\frac{5}{3}}$ c) $\frac{3}{5}$

b) $\frac{-5}{3}$ d) None of these

5. Find the area of the triangle with vertices P (4, 5), Q (4, -2), R (-6, 2)

a) 21 sq. units c) 30 sq. units

b) 35 sq. units d) 40 sq. units

6. Find the area of the triangle with vertices P (-2, 6), Q (3, -6), R (1, 5)

a) 30 sq. units c) 40 sq. units

b) 35 sq. units **d) 15.5 sq. units**

7. If $\begin{vmatrix} 3x & 7 \\ -2 & 4 \end{vmatrix} = \begin{vmatrix} 8 & 7 \\ 6 & 4 \end{vmatrix}$, then the value of x is

a) -2 c) 5

b) 2 d) 7

8. Find the area of the triangle with vertices (2, 7), (1, 1), (10, 8)

a) 47 sq. units **c) 23.5 sq. units**

b) 47.5 sq. units d) 30 sq. units

9. Find the value of y by Cramer's rule

x – 4y = -9

-x + 5y = 11

a) -1 c) 1

b) 2 d) None of these

10. Find the value of D_z if

2x – y + 6z = 10

-3x + 4y – 5z =11

8x – 7y – 9z = 12

a) 16 b) 17

c) 18 d) 19

11. The rule which provides method of solving the determinants is classified as

a) Cramer's rule c) Solving rule

b) Determinant rule d) Thumb rule

12. Apply Cramer's rule to solve the following equations.

$3x + y + 2z = 3$

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

$x + 2y + z = 4$

a) x = 1, y = 2, y = -1 c) x = 2, y = -1, y = 1

b) x = 2, y = 1, y = -1 d) x = 1, y = -1, y = 2

13. Apply Cramer's rule to solve the following equations.

$x + 3y + 6z = 2$

$3x - y + z = 9$

$x - 4y + 2z = 7$

a) x = 1, y = 2, y = -1 c) x = 1, y = 2, y = -0.5

b) x = 2, y = -1, y = -0.5 d) x = 2, y =2, y = -1

14. Apply Cramer's rule to solve the following equations.

$x + y + z = 3$

$x + 2y + 3z = 4$

$x + 4y + 9z = 1$

a) x = -0.5, y = 6, y = -2.5 c) x = 4.5, y = 6, z = 1

b) x = -0.5, y = 4, y = -2.5 d) x = 4.5, y = 6, z = 2

15. Apply Cramer's rule to solve the following equations.

$2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z = 2$

a) x = 1, y = 2, z = 3
c) x = 2, y = 3, z = 7
b) x = 2, y = 2, z = 3
d) x = 1, y = 3, z = 8

16. Cramer's rule fails for ----------

a) Determinant > 0
c) Determinant = 0
b) Determinant < 0
d) Determinant = non-real

17. Cramer's rule is not suitable for which type of problems?

a) Small system with 4 unknowns
c) Large systems
b) Systems with 2 unknowns
d) Systems with 3 unknowns

18. If the points (3, -2), (x, 2), (8, 8) are collinear, then the find the value of x

a) 2
c) 4
b) 3
d) **5**

3. Matrices

Position in Question Paper **Total Marks-14**

Q.2. a) 4-Marks.
Q.4. a) 4-Marks.
Q.6.c) 6-Marks

Descriptive Question

Definition:

A matrix is a rectangular array of numbers, symbols, or expressions, arranged in rows and columns.

Matrices are denoted by A, B, C……...

The order of a matrix is written as number of rows by number of columns. A matrix with m rows and n columns has an order m X n. A matrix of order m X n is written as

$$\mathbf{A}_{m\times n} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mn} \end{bmatrix}$$

It is also written as $A = [a_{ij}]_{mxn}$ where i = row index = 1, 2, ……..., m
and j= column index = 1, 2, ……., n

Q.1) If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$, Find X such that 2X+3A-4B=I **(S-18)**

Q.2) If $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}; B = \begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$; find the matrix X such that $2A + X = 3B$. **(S-17)**

Q.3) If $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \\ 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -1 \\ 3 & 2 \\ 4 & -2 \end{bmatrix}$; verify that $A + B = B + A$ **(S-16)**

Q.4) Find the value of a and b if $\begin{bmatrix} a-4b & 5 \\ 6 & -a+b \end{bmatrix} = \begin{bmatrix} 11 & 5 \\ 6 & -5 \end{bmatrix}$ **(S-16)**

Q.5) If $A = \begin{bmatrix} x & 2 & -5 \\ 3 & 1 & 2y \end{bmatrix}$ and $B = \begin{bmatrix} 2y+5 & 6 & -15 \\ 9 & 3 & -6 \end{bmatrix}$ and if $3A = B$, find x and y. **(S-14)**

Q.6) Find x, y, z if $\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$. **(W-15)**

Q.7) Find x and y if $\left\{4\begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 3 \end{bmatrix} - 2\begin{bmatrix} 1 & 3 & -1 \\ 2 & -3 & 4 \end{bmatrix}\right\}\begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$. **(S-18)**

Q.8) Find x, y, z if $\left\{\begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & 1 \\ 3 & 1 & 2 \end{bmatrix} + 2\begin{bmatrix} 3 & 0 & 2 \\ 1 & 4 & 5 \\ 2 & 1 & 0 \end{bmatrix}\right\}\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$. **(S-17)**

Scalar Matrix: - The **scalar matrix** is basically a square matrix, whose all off-diagonal elements are zero and all on-diagonal elements are equal.

eg.

$$\mathbf{A} = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

Q.9) If $A = \begin{bmatrix} 2 & 4 & 4 \\ 4 & 2 & 4 \\ 4 & 4 & 2 \end{bmatrix}$, show that $A^2 - 8A$ is a scalar matrix. **(W-18, S-19)**

Identity Matrix: - A square matrix in which all the main diagonal elements are 1's and all the remaining elements are 0's is called an **Identity Matrix**. Identity Matrix is also called **Unit Matrix**.

Identity Matrix is denoted with the letter "$\mathbf{I}_{n\times n}$", where $n \times n$ represents the order of the matrix.

eg.

$$I_{2x2} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \qquad I_{3x3} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Q.10) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$; find $A^2 - 3A + 9I$ where I is unit matrix. **(W-14)**

Q.11) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$; prove that $A^2 = I$. **(W-18)**

Zero Matrix or Null Matrix: -

A **zero matrix** or null **matrix** is a **matrix** all of whose entries are **zero**.

eg.

$$O_{2x2} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}, \qquad O_{3x3} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Q.12) If $A = \begin{bmatrix} 3 & 9 \\ -1 & -3 \end{bmatrix}$; show that A^2 is null matrix. **(S-17)**

Q.13) If $A = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}; B = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}; C = \begin{bmatrix} -3 & 1 \\ 2 & 0 \end{bmatrix}$; verify that $A(B + C) = AB + AC$ **(W-14)**

Q.14) If $A = \begin{bmatrix} 1 & -2 \\ -3 & -1 \end{bmatrix}; B = \begin{bmatrix} 4 & 2 & -5 \\ 1 & 0 & 3 \end{bmatrix}; C = \begin{bmatrix} 6 & -7 & 0 \\ -1 & 2 & 5 \\ 1 & 0 & 3 \end{bmatrix}$, prove that $(AB)C = A(BC)$. **(S-15)**

Q.15) If $A = \begin{bmatrix} 2 & 1 & 0 \\ -1 & 3 & 2 \end{bmatrix}; B = \begin{bmatrix} 1 & 3 \\ 3 & 0 \\ 0 & 1 \end{bmatrix}; C = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$; find $(AB)C$. **(W-15)**

Transpose of a matrix: -

If $= [a_{ij}]$, then its transpose $A^T or\ A' = [a_{ij}]$ is obtained by interchanging the rows and the columns.

Q.16) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}; B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$; verify that $(AB)^T = B^T A^T$. **(S-16)**

Q.17) If $A = \begin{bmatrix} 2 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}; B = \begin{bmatrix} 6 & 1 \\ 0 & 4 \\ 5 & 7 \end{bmatrix}$; verify that $(AB)^T = B^T A^T$. **(W-17)**

Q.18) If $= \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$, verify $(AB)^T = B^T A^T$. **(W-19)**

Q.19) If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}$, find $A^T + B^T$ and $A^T - B^T$ **(W-15)**

Symmetric Matrix: -

A square matrix A is symmetric if $a_{ij} = a_{ji}$ for all i and j

eg.

$$A = \begin{bmatrix} 2 & 3 & 5 \\ 3 & 7 & 0 \\ 5 & 0 & 1 \end{bmatrix}$$

Skew-Symmetric Matrix: -

A square matrix A is Skew-Symmetric if $a_{ij} = -a_{ji}$ for all i and j and all diagonal elements are zero.

eg.

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

Q.20) Express the matrix A as sum of symmetric and skew symmetric matrix of $A = \begin{bmatrix} -1 & 7 & 1 \\ 2 & 3 & 4 \\ 5 & 0 & 5 \end{bmatrix}$. **(S-15, S-17)**

Q.21) Express the matrix A as sum of symmetric and skew symmetric matrix of $A = \begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$.

Orthogonal Matrix: -

If $AA^T = A^T A = I$, then the matrix A is called orthogonal

Q.22) Show that matrix $A = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$ is an orthogonal matrix. **(W-16)**

Singular Matrix: -

A square matrix A is singular if $|A| = 0$

Non-Singular Matrix: -

A square matrix A is non-singular if $|A| \neq 0$

Q.23) If $A = \begin{bmatrix} 7 & 0 & 2 \\ 1 & 2 & 6 \\ 4 & 5 & 3 \end{bmatrix}$; find whether matrix is singular or non − singular. **(S-16)**

Q.24) If $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 1 & -3 \\ 0 & -1 & 1 \end{bmatrix}$; find |A| and verify that matrix A is singular or non − singular matrix. **(S-17)**

Q.24) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$; B =

$\begin{bmatrix}1 & 2\\ 3 & -2\end{bmatrix}$; whether AB is singular or non − singular matrix? **(W-17)**

Q.25) If $A=\begin{bmatrix}-2 & 0 & 2\\ 3 & 4 & 5\end{bmatrix}, B=\begin{bmatrix}2 & 1\\ 3 & 5\\ 0 & 2\end{bmatrix}$, Whether AB is singular or non-singular matrix? **(W-19)**

Q.26) If $A=\begin{bmatrix}3 & 2 & -5\\ 4 & 5 & 0\end{bmatrix}, B=\begin{bmatrix}5 & 1\\ -2 & 3\\ 0 & -1\end{bmatrix}$, Whether AB is singular or non-singular matrix?

Q.28) Find the adjoint of matrix $A=\begin{bmatrix}2 & 5 & 3\\ 3 & 1 & 2\\ 1 & 2 & 1\end{bmatrix}$. **(S-19)**

Q.29) Find the adjoint of matrix $A=\begin{bmatrix}-1 & 1 & 1\\ 2 & 4 & 4\\ 3 & 2 & 1\end{bmatrix}$. **(S-10)**

Q.30) Find the adjoint of matrix $A=\begin{bmatrix}1 & 0 & -1\\ 3 & 4 & 5\\ 0 & -6 & -7\end{bmatrix}$. **(S-18)**

Q.31) Find inverse of matrix $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$. **(W-15)**

Q.32) Find A^{-1} by adjoint method, if $A=\begin{bmatrix}1 & 2 & 4\\ -1 & 2 & 3\\ 1 & 4 & 1\end{bmatrix}$. **(S-15)**

Q.33) *F*ind the inverse of the matrix by using adjoint method.

$A=\begin{bmatrix}1 & 2 & -2\\ -1 & 3 & 0\\ 0 & -2 & 1\end{bmatrix}$. **(S-16)**

Q.34) Find the inverse of the matrix $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 4 & 5\\ 3 & 5 & 6\end{bmatrix}$ by adjoint method. ***(W-16)***

Q.35) Find A^{-1} by adjoint method, if $A=\begin{bmatrix}2 & -1 & 0\\ 1 & 0 & 4\\ 1 & -1 & 1\end{bmatrix}$. **(S-17)**

Q.36) Solve the following equations by matrix inversion method.

$x + y + z = 3;\quad 3x - 2y + 3z = 4;\quad 5x + 5y + z = 11$. **(W-16, W-19)**

Q.37) Using matrix inversion method solve the following equations.
$x + y + z = 3;\quad x + 2y + 3z = 4;\quad x + 4y + 9z = 6$. **(S-17, W-17)**

Q.38) Solve the following equations by matrix inversion method.
$x + 3y + 2z = 6;\quad 3x - 2y + 5z = 5;\quad 2x - 3y + 6z = 7$ **(W-15, W-18)**

Q.39) Solve the following equations by by matrix inversion method.
$x + y + z = 6;\quad 3x - y + 3z = 10;\quad 5x + 5y - 4z = 3$. **(S-19)**

Q.40) Solve the following equations by by matrix inversion method.
$x + 3y + 3z = 12;\quad x + 4y + 4z = 15;\quad x + 3y + 4z = 13$. **(S-18)**

Q.41) Solve the following equations by matrix inversion method.
$3x + y + 2z = 3;\quad 2x - 3y - z = -3;\quad x + 2y + z = 4$. (**S-16)**

Q.42) Solve the following equations by matrix inversion method
$2x + y = 3;\quad 2y + 3z = 4;\quad 2x + 2z = 8$. **(W-13)**

MCQ Question

(Total number of Question=Marks*3=14*3=42)

Note: Correct answer is marked with **bold**

1. The transpose of a rectangular matrix is a

a) Rectangular matrix c) Square matrix

b) Diagonal matrix d) Scalar matrix

2. The transpose of a column matrix is

a) Zero matrix c) Column matrix

b) Diagonal matrix **d) Row matrix**

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

a) Both are rectangular **c) No. of columns of A is equal to rows of B**

b) Both have same order d) No. of rows of A is equal to no. of columns of B

4. If $|A| = 0$, then A is

a) Zero matrix **b) Singular matrix**

c) Non-singular matrix d) 0

5. If A is a symmetric matrix, then $A' =$

a) A d) Diagonal matrix

b) $|A|$

c) 0

6. $(AB)' = ?$

a) $A'B'$ **b) $B'A'$**

c) $\frac{1}{AB}$ d) AB

7. For any non-singular A, A^{-1} is equal to

a) $|A|Adj(A)$ b) $\frac{1}{|A|Adj(A)}$

c) $\frac{Adj(A)}{|A|}$ d) None of the above

8. A matrix having m rows and n columns with m ≠ n is said to be a

a) Rectangular matrix c) Identity matrix

b) Square matrix d) Scalar matrix

9. $[a \quad b \quad c]$ is a

a) Zero matrix c) Column matrix

b) Diagonal matrix **d) Row matrix**

10. Two matrices A and B are added 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

11. The transpose of a row matrix is

a) Zero matrix b) Diagonal matrix

c) Column matrix d) Row matrix

12. Matrices obtained by interchanging rows and columns are called

a) Rectangular matrix c) Symmetric matrix

b) Transpose matrix d) None of the above

13. $[0 \quad 0 \quad 0]$ is

a) Scalar matrix c) Identity matrix

b) Diagonal matrix **d) Null matrix**

14. If A is a matrix of order m X n and B is a matrix of order n X p, then the order of AB is

a) p X m c) n X p

b) p X n **d) m X p**

15. The transpose of a square matrix is a

a) Rectangular matrix **c) Square matrix**

b) Diagonal matrix d) Scalar matrix

16. If $|A| \neq 0$, then A is

a) Zero matrix **c) Non-singular matrix**

b) Singular matrix d) Diagonal matrix

17. If A is a skew symmetric matrix, then A' is equal is

a) -A c) O

b) A d) Diagonal matrix

18. Two matrices A and B are equal if

a) Both are rectangular

b) Both have same order

c) No. of columns of A is equal to rows of B

d) Both have same order and equal corresponding elements

19. The order of a matrix $|2 \quad 5 \quad 7|$ is

a) 3 X 3
c) 3 X 1
b) 1 X 1
d) 1 X 3

20. Find the value of 'a' if $B = \begin{vmatrix} 1 & 4 \\ 2 & a \end{vmatrix}$ is a singular matrix

a) 5
c) 7
b) 6
d) 8

21. Skew symmetric matrix are also called

a) Symmetric matrix
c) Square matrix
b) Identity matrix
d) Anti-symmetric matrix

22. A diagonal matrix having equal elements is called a

a) Square matrix
c) Scalar matrix
b) Identical matrix
d) Rectangular matrix

23. In matrices $(A + B)^T$ equals to

a) A^T
c) $\boldsymbol{A^T + B^T}$
b) B^T
d) $A^T B^T$

24. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$, then AB^T is equal to

a) $\begin{bmatrix} -3 & -2 \\ 10 & 7 \end{bmatrix}$
c) $\begin{bmatrix} -3 & 7 \\ 10 & 2 \end{bmatrix}$
b) $\begin{bmatrix} \mathbf{-3} & \mathbf{10} \\ \mathbf{-2} & \mathbf{7} \end{bmatrix}$
d) None of these

25. The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is

a) Skew-symmetric matrix
c) Diagonal matrix
b) Symmetric matrix
d) Upper triangular matrix

26. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ then adj (A) is

a) $\begin{bmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{bmatrix}$

c) $\begin{bmatrix}\boldsymbol{\cos\theta} & \boldsymbol{\sin\theta} \\ \boldsymbol{-\sin\theta} & \boldsymbol{\cos\theta}\end{bmatrix}$

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

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

27. If $A = \begin{bmatrix}6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1\end{bmatrix}$ is the sum of a symmetric matrix B and skew-symmetric matrix C, then B is

a) $\begin{bmatrix}\mathbf{6} & \mathbf{6} & \mathbf{7} \\ \mathbf{6} & \mathbf{2} & \mathbf{5} \\ \mathbf{7} & \mathbf{5} & \mathbf{1}\end{bmatrix}$

c) $\begin{bmatrix}6 & 6 & 7 \\ -6 & 2 & -5 \\ -7 & 5 & 1\end{bmatrix}$

b) $\begin{bmatrix}0 & 2 & -2 \\ -2 & 5 & -2 \\ 2 & 2 & 0\end{bmatrix}$

d) $\begin{bmatrix}0 & 6 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 0\end{bmatrix}$

28. Find the determinant of the matrix

$\begin{bmatrix}-2 & -5 \\ -2 & -5\end{bmatrix}$

a) -28

c) 20

b) -20

d) 0

29. Find x if $\begin{bmatrix}1 & 2 & x \\ 1 & 1 & 1 \\ 2 & 1 & -1\end{bmatrix}$ is singular

a) 1

c) 3

b) 2

d) 4

30. If $\left\{3\begin{bmatrix}3 & 1 \\ 4 & 0 \\ 3 & -3\end{bmatrix} - 2\begin{bmatrix}0 & 2 \\ -2 & 3 \\ -5 & 4\end{bmatrix}\right\}\begin{bmatrix}-1 \\ 2\end{bmatrix} = \begin{bmatrix}x \\ y \\ z\end{bmatrix}$, find x, y, z

a) x = -11, y = -28, z = -53

c) x = 11, y = -28, z = 53

b) x = 11, y = 28, z = 53

d) x = 11, y = -28, z = -53

31. Find x and y, if $\left\{3\begin{bmatrix}4 & 1 & 3\\ 0 & -1 & -3\end{bmatrix} - 2\begin{bmatrix}3 & 2 & 4\\ -6 & 1 & -3\end{bmatrix}\right\}\begin{bmatrix}1\\ 3\\ -2\end{bmatrix} = \begin{bmatrix}x\\ y\end{bmatrix}$

a) x = -1, y = 3

c) x = -1, y = -3

b) x = 1, y = 3

d) x = 1, y = -3

32. Find x, y, z if $\left\{\begin{bmatrix}1 & 3 & 2\\ 2 & 0 & 1\\ 3 & 1 & 2\end{bmatrix} + 2\begin{bmatrix}3 & 0 & 2\\ 1 & 4 & 5\\ 2 & 1 & 0\end{bmatrix}\right\}\begin{bmatrix}1\\ 2\\ 3\end{bmatrix} = \begin{bmatrix}x\\ y\\ z\end{bmatrix}$

a) x = -31, y = -53, z = -19

c) x = 31, y = 53, z = 19

b) x = -31, y = 53, z = 19

d) x = 31, y = -53, z = 19

33. If $A = \begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix}, B = \begin{bmatrix}1\\ 9\\ 8\end{bmatrix}$, find AB

a) $\begin{bmatrix}\mathbf{43}\\ \mathbf{97}\end{bmatrix}$

c) $\begin{bmatrix}43\\ 90\end{bmatrix}$

b) $\begin{bmatrix}40\\ 97\end{bmatrix}$

d) $\begin{bmatrix}-43\\ -97\end{bmatrix}$

34. If $A = \begin{bmatrix}1 & 3 & 2\\ -1 & 2 & 0\\ 4 & 0 & 3\end{bmatrix}; B = \begin{bmatrix}1 & 0 & 0\\ 1 & 2 & 0\\ 1 & 0 & 3\end{bmatrix}$ *and* $C = \begin{bmatrix}2 & 1 & 2\\ 2 & 2 & 1\\ 1 & 2 & 2\end{bmatrix}$, then find the matrix D such that 2A – 3B – D = C

a) $\begin{bmatrix}3 & 5 & 2\\ -1 & 8 & -1\\ 10 & -2 & 13\end{bmatrix}$

c) $\begin{bmatrix}-9 & 5 & 8\\ 7 & 4 & 5\\ 4 & -5 & 3\end{bmatrix}$

b) $\begin{bmatrix}\mathbf{-3} & \mathbf{5} & \mathbf{2}\\ \mathbf{-7} & \mathbf{-4} & \mathbf{-1}\\ \mathbf{4} & \mathbf{-2} & \mathbf{-5}\end{bmatrix}$

d) None of these

35. If $AA^T = A^TA = I$, then matrix A is called

a) Singular matrix

b) Identity matrix

c) Orthogonal matrix d) Symmetric matrix

36. Find the inverse of the matrix $A = \begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

a) $\begin{bmatrix} \mathbf{1} & \mathbf{-1} & \mathbf{1} \\ \mathbf{-8} & \mathbf{7} & \mathbf{-5} \\ \mathbf{5} & \mathbf{-4} & \mathbf{3} \end{bmatrix}$

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

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

d) $\begin{bmatrix} 1 & -1 & 1 \\ -6 & 4 & -5 \\ 5 & -4 & 3 \end{bmatrix}$

37. If $A = \begin{bmatrix} 4 & -5 & 2 \\ 0 & 6 & 9 \\ 2 & 7 & 8 \end{bmatrix}$, the diagonal elements are

a) 4, 6, 8
c) 2, 6, 2
b) 4, 0, 2
d) All of the above

38. If $A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$, then product BA is

a) $\begin{bmatrix} \mathbf{3} & \mathbf{2} \\ \mathbf{13} & \mathbf{7} \end{bmatrix}$

c) $\begin{bmatrix} -3 & 2 \\ 13 & 7 \end{bmatrix}$

b) $\begin{bmatrix} 3 & -2 \\ 13 & -7 \end{bmatrix}$

d) None of these

39. If $A = \begin{bmatrix} 1 & 4 \\ 2 & 5 \end{bmatrix}, B = \begin{bmatrix} -2 & -1 \\ 3 & 0 \end{bmatrix}$, then A-2B-I gives

a) $\begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix}$

c) $\begin{bmatrix} \mathbf{4} & \mathbf{6} \\ \mathbf{-4} & \mathbf{6} \end{bmatrix}$

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

d) $\begin{bmatrix} 4 & 6 \\ 4 & -6 \end{bmatrix}$

40. If $B = \begin{bmatrix} 2 & -3 \\ 1 & 6 \end{bmatrix}$, then transpose of B is

a) $\begin{bmatrix} 2 & 1 \\ 3 & 6 \end{bmatrix}$

c) $\begin{bmatrix} 2 & -3 \\ 1 & 6 \end{bmatrix}$

b) $\begin{bmatrix} \mathbf{2} & \mathbf{1} \\ \mathbf{-3} & \mathbf{6} \end{bmatrix}$

d) $\begin{bmatrix} 2 & 3 \\ 1 & -6 \end{bmatrix}$

41. If $A = \begin{bmatrix} 4 & 5 \\ -2 & 3 \end{bmatrix}$, then $(A^T)^T$ is

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

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

b) $\begin{bmatrix} \mathbf{4} & \mathbf{5} \\ \mathbf{-2} & \mathbf{3} \end{bmatrix}$

d) None of these

42. If $A = \begin{bmatrix} 3 & -6 \\ 2 & -4 \end{bmatrix}$, then $|A|$ is

a) -12

c) 0

b) 12

d) None of the above

43. The matrix $A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$ is a

a) Symmetric matrix

c) Orthogonal matrix

b) skew-symmetric matrix

d) Singular matrix

44. If $A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$, then $|A|$ =?

a) 30

c) 50

b) 40

d) 60

45. The matrix $A = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix}$ is a

a) Even matrix

c) Scalar matrix

b) Odd matrix

d) Identity matrix

4. Partial Fraction

Position in Question Paper **Total Marks-08**

Q.2. b) 4-Marks.
Q.4. b) 4-Marks.

Descriptive Question

Proper Fraction: -

When the degree of the polynomial in the numerator is less than the degree of the polynomial in denominator, the fraction is called proper fraction.

Case-I

When denominator has distinct linear factors

To every linear factor $(ax+b)$ in the denominator of a proper fraction, there exists a partial fraction of the form

$\frac{P(x)}{Q(x)} = \frac{A_1}{a_1x+b_1} + \frac{A_2}{a_2x+b_2} + \frac{A_3}{a_3x+b_3} + \cdots + \frac{A_n}{a_nx+b_n}$ where $A_1, A_2, A_3, \ldots\ldots, A_n \epsilon R$

Q.1) Resolve into partial fractions. $\frac{x+4}{x(x+1)}$. **(S-17)**

Q.2) Resolve into partial fractions. $\frac{x+3}{(x-1)(x+1)(x+5)}$. **(W-17)**

Q.3) Resolve into partial fractions. $\frac{3x-1}{(x-4)(x+1)(x-1)}$. **(W-17)**

Q.4) Resolve into partial fractions. $\frac{1}{x^3-x}$. **(S-15)**

Q.5) Resolve into partial fractions. $\frac{x^3+1}{x^2+6x}$. **(S-15)**

Q.6) Resolve into partial fractions $\frac{e^x+1}{(e^x+2)(e^x+3)}$. **(W-15)**

Q.7) Resolve into partial fractions $1 + \frac{1}{x^2-1}$. **(S-16)**

Q.8) Resolve into partial fractions $\frac{x-5}{x^3+x^2-6x}$. **(S-16)**

Q.9) Resolve into partial fractions $\frac{3x-1}{(x-4)(2x+1)(x-1)}$. **(W-16)**

Q.10) Resolve into partial fractions $\frac{x-5}{x^3+x^2-6x}$. **(S.Q.P)**

Q.11) Resolve into partial fractions $\frac{x^2+1}{(x)(x^2-1)}$. **(S-17, S-18)**

Q.12) Resolve into Partial Fraction $\frac{2x+3}{x^2-2x-3}$. **(W-19)**

Case-II

When denominator has repeated linear factors

To every linear factor $(ax+b)$, occurring n times in the denominator, there exists a sum on n partial fractions

$\frac{P(x)}{Q(x)} = \frac{A_1}{(ax+b)} + \frac{A_2}{(ax+b)^2} + \frac{A_3}{(ax+b)^3} + \cdots + \frac{A_n}{(ax+b)^n}$, where $A_1, A_2, A_3, \ldots\ldots, A_n \epsilon R$

Q.13) Resolve into partial fractions. $\frac{3x+2}{(x+1)(x^2-1)}$. **(S-19)**

Q.14) Resolve into partial fractions $\frac{x^2}{(x+1)(x+2)^2}$. **(S-17)**

Case-III

When denominator has distinct irreducible quadratic factor

To every irreducible quadratic factor ax^2+bx+c, in the denominator, there exists a partial fraction of the form

$$\frac{P(x)}{Q(x)} = \frac{A}{ax+b} + \frac{B}{ax^2+bx+c}$$

Q.15) Resolve into partial fractions. $\frac{x^2+23x}{(x+3)(x^2+1)}$. **(S.Q.P, W-16, W-18)**

Q.16) Resolve into partial fractions. $\frac{x^2-x+3}{(x-2)(x^2+1)}$. **(W-17)**

Q.17) Resolve into partial fractions. $\frac{x^2+36x+6}{(x-1)(x^2+2)}$. **(S-15)**

Q.18) Resolve into partial fractions $\frac{x}{x^3+1}$. **(W-15)**

Q.19) Resolve into partial fractions $\frac{3x-2}{(x+2)(x^2+4)}$. **(S-16, W-19)**

Q.20) Resolve into partial fractions $\frac{x^2+1}{(x+1)(x^2+4)}$. **(S-17)**

Q.21) Resolve into partial fractions $\frac{2x+1}{(x-1)(x^2+1)}$. **(S-17)**

Improper Fraction: -

When the degree of the polynomial in the numerator is greater than or equal to the degree of the polynomial in denominator, the fraction is called improper fraction.

Q.22) Resolve into partial fractions. $\frac{x^4}{x^3+1}$. **(S-17, S-19)**

Q.23) Resolve into partial fractions. $\frac{x^3+1}{x^2+6x}$. **(S-15)**

Q.24) Resolve into partial fractions $\frac{x^3}{x^2-1}$. **(S-16)**

MCQ Question

(Total number of Question=Marks*3=8*3=24)

Note: Correct answer is marked with **bold.**

1. The equivalent partial fraction of $\frac{x+11}{(x+1)(x-3)^2}$

a) $\frac{A}{x+1}+\frac{B}{(x-3)^2}$

c) $\frac{A}{x+1}+\frac{Bx+C}{(x-3)^2}$

b) $\boldsymbol{\frac{A}{x+1}+\frac{B}{x-3}+\frac{C}{(x-3)^2}}$

d) *None of these*

2. Form of partial fraction of $\frac{1}{(x+1)(x-2)}$ is

a) $\boldsymbol{\frac{A}{x+1}+\frac{B}{x-2}}$

c) $\frac{A}{x+1}+\frac{Bx+C}{x-2}$

b) $\frac{Ax+B}{x+1}+\frac{C}{x-2}$

d) None of these

3. State the type of partial fraction of $\frac{125+4x-9x^2}{(x-1)(x+3)(x+4)}$

a) Linear factor

c) Quadratic factor

b) Repeated factor

d) Improper fraction

4. State the type of partial fraction of $\frac{6x+5}{(2x-1)^2}$

a) Linear factor

c) Quadratic factor

b) Repeated factor

d) Improper fraction

5. If $\frac{5}{(x-1)^2}=\frac{A}{(x-1)^2}+\frac{B}{x-1}$, then the value of A is

a) 0

c) 2

b) 1

d) 5

6. If $x+2=A(x+1)+B(x)$, then the value of A will be

a) -2

b) -1

c) 1

d) 2

7. Resolve into Partial Fraction $\frac{-5x-41}{x^2+x-12}$

a) $\frac{3x}{x+4}-\frac{8x}{x-3}$

c) $\frac{3}{x+4}-\frac{8}{x-3}$

b) $\frac{\mathbf{-21}}{\boldsymbol{x-3}}+\frac{\mathbf{16}}{\boldsymbol{x+4}}$

d) $\frac{-8}{x+4}+\frac{3}{x-3}$

8. Resolve into Partial Fraction $\frac{x+14}{(x-4)(x+2)}$

a) $\frac{\mathbf{3}}{\boldsymbol{x-4}}-\frac{\mathbf{2}}{\boldsymbol{x+2}}$

c) $\frac{2}{x-4}-\frac{3}{x+2}$

b) $\frac{-5}{x-4}+\frac{6}{x+2}$

d) $\frac{-2}{x-4}+\frac{3}{x+2}$

9. The partial fraction decomposition of $\frac{2}{x^2-1}$ is

a) $\frac{1}{x-1}+\frac{1}{x+1}$

c) $\frac{1}{x+1}-\frac{1}{x-1}$

b) $\frac{\mathbf{1}}{\boldsymbol{x-1}}-\frac{\mathbf{1}}{\boldsymbol{x+1}}$

d) None of these

10. $\frac{9x^2}{x^3-1}$ is

a) Improper fraction

c) Polynomial

b) Proper fraction

d) Equation

11. $\frac{x^2-3}{3x+1}$

a) Polynomial

c) Improper fraction

b) Equation

d) Proper fraction

12. x^3+2x^2-3x+5 is

a) An equation

c) Proper fraction

b) A polynomial

d) Improper fraction

13. Partial fraction of $\frac{ax+b}{(cx+d)^2}$ =

a) $\frac{A}{cx+d}+\frac{B}{(cx+d)^2}$

c) $\frac{Ax+B}{cx+d}+\frac{C}{(cx+d)^2}$

b) $\frac{A}{cx+d}+\frac{Bx+c}{(cx+d)^2}$

d) None of these

14. Partial fraction of $\frac{7x+25}{(x+3)(x+4)}$ =

a) $\frac{3}{x+3}+\frac{5}{x+4}$

c) $\frac{4}{x+3}+\frac{3}{x+4}$

b) $\frac{6}{x+3}+\frac{5}{x+4}$

d) None of these

15. An improper fraction can be reduced to proper fraction by

a) Addition

c) Multiplication

b) Subtraction

d) Division

16. Partial fractions of $\frac{x^2+1}{x^3+1}$ will be of the form

a) $\frac{A}{x-1}+\frac{B}{x^2-x+1}$

c) $\frac{A}{x+1}+\frac{Bx+c}{x^2-x+1}$

b) $\frac{A}{x+1}+\frac{B}{x^2-x+1}$

d) None of these

17. Resolve into Partial Fraction $\frac{x}{(x+2)(x-3)}$

a) $\frac{2}{5(x+2)}-\frac{3}{5(x-3)}$

c) $\frac{2}{5(x-2)}+\frac{3}{5(x+3)}$

b) $\frac{2}{5(x+2)}+\frac{3}{5(x-3)}$

d) None of these

18. A fraction in which the degree of the numerator is less the degree of the denominator is called

a) Polynomial

c) Proper fraction

b) Equation

d) Improper fraction

19. The quotient of two polynomials $\frac{P(x)}{Q(x)}$ where $Q(x) \neq 0$ with no common fraction is called a

a) An expression
c) Equation
b) Rational fraction
d) Identity

20. Partial fraction of $\frac{1}{(x^2+1)(x+1)}$ =

a) $\frac{A}{x^2+1}+\frac{B}{x+1}$
c) $\frac{A}{x^2+1}+\frac{Bx+C}{x+1}$
b) $\frac{Ax+B}{x^2+1}+\frac{C}{x+1}$
d) None of these

21. Which of the following shows the correct factors of the denominator in the fraction shown below?

$\frac{3x-18}{2x^2-5x-3}$

a) $\boldsymbol{(2x+1)(x-3)}$
c) $(2x+1)(x+3)$
b) $(2x-1)(x+3)$
d) $(2x-1)(x-3)$

22. Decompose into partial fractions $\frac{5x^2+12x+3}{x(x+1)^2}$

a) $\boldsymbol{\frac{3}{x}+\frac{2}{x+1}+\frac{4}{(x+1)^2}}$
c) $\frac{3}{x}-\frac{2}{x+1}+\frac{4}{(x+1)^2}$
b) $\frac{3}{x}+\frac{2}{x+1}-\frac{4}{(x+1)^2}$
d) $\frac{3}{x}-\frac{2}{x+1}-\frac{4}{(x+1)^2}$

23. Decompose into partial fractions $\frac{3x+15}{(x+4)^2}$

a) $\frac{-3}{x+4}-\frac{3}{(x+4)^2}$
c) $\frac{3}{(x+4)^2}$
b) $\boldsymbol{\frac{3}{x+4}+\frac{3}{(x+4)^2}}$
d) $\frac{-3}{(x+4)^2}$

24. Decompose into partial fractions $\frac{7x+10}{(x+1)(x^2-4)}$

a) $\frac{2}{x-2}-\frac{1}{x+2}-\frac{1}{x+1}$

c) $\frac{-2}{x-2}+\frac{1}{x+2}+\frac{1}{x+1}$

b) $\frac{-1}{x-2}+\frac{2}{x+2}+\frac{1}{x+1}$

d) None of these

25. Decompose into partial fractions $\frac{5x^2+31x+46}{(x+2)(x+3)^2}$

a) $\frac{-4}{x+2}-\frac{1}{x+3}-\frac{2}{(x+3)^2}$

c) $\frac{4}{x+2}+\frac{1}{x+3}+\frac{2}{(x+3)^2}$

b) $\frac{4}{x+2}-\frac{1}{x+3}-\frac{2}{(x+3)^2}$

d) None of these

26. Decompose into partial fractions $\frac{2x^2+6x-2}{x^3-1}$

a) $\frac{-2}{x-1}-\frac{4}{x^2+x+1}$

c) $\frac{2}{x-1}-\frac{4}{x^2+x+1}$

b) $\frac{2}{x-1}+\frac{4}{x^2+x+1}$

d) $\frac{-2}{x-1}+\frac{4}{x^2+x+1}$

5. Trigonometric ratios of Compound, Allied, Multiple and Sub-multiple Angles

Position in Question Paper **Total Marks-14**

Q.1. c) 2-Marks.
Q.3. a) 4-Marks.
Q.3. b) 4-Marks.
Q.4. e) 4-Marks.

Descriptive Question

Compound Angle:

The angle obtained by algebraic sum or difference of two or more angles is called a compound angle

Formulae:

i) $\cos(A+B) = \cos A \cos B - \sin A \sin B$

ii) $\cos(A-B) = \cos A \cos B + \sin A \sin B$

iii) $\sin(A+B) = \sin A \cos B + \cos A \sin B$

iv) $\sin(A-B) = \sin A \cos B - \cos A \sin B$

Allied Angle:

If the sum or difference of the measures of two angles is either zero is an integral multiple of 90^0, that is, $n.\frac{\pi}{2}$ where $n \epsilon I$, then these angles are called allied angles

Formulae:

Angle / Trig. Ratio	$\frac{\pi}{2}-\theta$	$\frac{\pi}{2}+\theta$	$\pi-\theta$	$\pi+\theta$	$\frac{3\pi}{2}-\theta$	$\frac{3\pi}{2}+\theta$	$2\pi-\theta$	$2\pi+\theta$
Sin	$\cos\theta$	$\cos\theta$	$\sin\theta$	$-\sin\theta$	$-\cos\theta$	$-\cos\theta$	$-\sin\theta$	$\sin\theta$
Cos	$\sin\theta$	$-\sin\theta$	$-\cos\theta$	$-\cos\theta$	$-\sin\theta$	$\sin\theta$	$\cos\theta$	$\cos\theta$
Tan	$\cot\theta$	$-\cot\theta$	$-\tan\theta$	$\tan\theta$	$\cot\theta$	$-\cot\theta$	$-\tan\theta$	$\tan\theta$
Cot	$\tan\theta$	$-\tan\theta$	$-\cot\theta$	$\cot\theta$	$\tan\theta$	$-\tan\theta$	$-\cot\theta$	$\cot\theta$
cosec	$\sec\theta$	$\sec\theta$	$\operatorname{cosec}\theta$	$-\operatorname{cosec}\theta$	$-\sec\theta$	$-\sec\theta$	$-\operatorname{cosec}\theta$	$\operatorname{cosec}\theta$
Sec	$\operatorname{cosec}\theta$	$-\operatorname{cosec}\theta$	$-\sec\theta$	$-\sec\theta$	$-\operatorname{cosec}\theta$	$\operatorname{cosec}\theta$	$\sec\theta$	$\sec\theta$

Q.1) Without using calculator find the value of $\sin(-765^0)$ **(S.Q.P)**

Q.2) Without using calculator find the value of $\cos(-765^0)$ **(W-19)**

Q.3) Without using calculator find the value of $\sin(105^0)$ **(W-17)**

Q.4) Without using calulator, find the value of $\cos(105^0)$. **(S-19)**

Q.5) Find the value of $\sin(15^0)$ using compound angles. **(W-18)**

Q.6) Without using calculator, find the value of $\sec(3660^0)$. **(S-18)**

Q.7) Without using calulator, find the value of $\cos(75^0)$. **(S-17)**

Q.8) Without using calulator, find the value of $\sin(75^0)$. **(W-15)**

Q.9) Without using calulator, find the value of $\tan(75^0)$ **(W-12)**

Q.10) Prove that $\sin 420^0 \cos 390^0 + \cos(-300^0)\sin(-330^0) = 1$. **(S-19)**

Q.11) Without usin calculator, find the value of
$\cos 570^0 \sin 510^0 + \sin(-330^0)\cos(-390^0)$. **(S-18)**

Q.12) If $\angle A$ & $\angle B$ are both obtuse angles and $\sin A = \frac{12}{13}$ and

$\cos B = \frac{-4}{5}$. Find $\sin(A + B), \cos(A + B)$. **(S.Q.P, W-19)**

Q.13) If $\tan A = \frac{1}{2,}$ $\tan B = \frac{1}{3}$, find the value of $\tan(A + B)$ **(W-18, S-16)**

Q.14) If $\angle A$ & $\angle B$ are both obtuse angles and $\sin A = \frac{5}{13}$ and

$\cos B = \frac{-4}{5}$. Find $(i) \sin(A + B)$. **(S.Q.P, S-18)**

$(ii) \tan(A + B)$ **(S-15)**

$(iii) \cos(A + B)$ **(S-13)**

Q.15) If $\cos A = -\frac{3}{5}$ *and* $\sin B = \frac{20}{29}$, where A and B are the angles in the third and second quadrant respectively. Find $\tan(A + B)$ **(S-15)**

Q.16) If $\tan(x + y) = \frac{3}{4}$ and $\tan(x - y) = \frac{8}{15}$. Prove that $\tan 2x = \frac{77}{36}$. **(W-17)**

OR

Given $\tan(A + B) = \frac{3}{4}$; $\tan(A - B) = \frac{77}{36}$, find $\tan 2A$. **(S-16)**

Q.17) If $\tan x = \frac{5}{6}$ *and* $\tan y = \frac{1}{11}$, prove that $x + y = \frac{\pi}{4}$ **(W-14)**

Q.18) Prove that $\sin(A + B)\sin(A - B) = \sin^2 A - \sin^2 B$. **(W-17)**

Q.19) If $\tan A = \frac{1}{2,}$ $\tan B = \frac{1}{3}$, find the value of $\tan(A + B)$. **(W-18, S-16)**

Q.20) Prove $\tan\left(\frac{\pi}{4} + A\right) = \frac{\cos A + \sin A}{\cos A - \sin A}$. **(W-18)**

Q.21) Prove that $\tan 3A - \tan 2A - \tan A = \tan 3A \tan 2A \tan A$ **(S-10)**

Q.22) Prove that $\tan 70^0 - \tan 50^0 - \tan 20^0 = \tan 70^0 \tan 50^0 \tan 20^0$ **(S-19)**

Q.23) If $A + B = \frac{\pi}{4}$; show that $(1 + \tan A)(1 + \tan B) = 2$. **(S-16)**

Q.24) Prove that $1 + \tan\theta \tan 2\theta = \sec 2\theta$ **(W-19)**

Q.25) Prove that $\frac{1 - \tan 2\theta \tan\theta}{1 + \tan 2\theta \tan\theta} = \frac{\cos 3\theta}{\cos\theta}$ **(W-13, S-17)**

Q.26) Simplify $\frac{\cos^2(180^0 - \theta)}{\sin(-\theta)} + \frac{\cos^2(270^0 + \theta)}{\sin(180^0 + \theta)}$. **(S.Q.P, W-19)**

Q.27) Evaluate without using calculator $\frac{\tan 66^0+\tan 690^0}{1-\tan 66^0 \tan 69^0}$. **(W-14)**

Q.28) Evaluate without using calculator $\frac{\tan 32^0+\tan 88^0}{1-\tan 32^0 \tan 88^0}$. **(S-16)**

Q.29) Evaluate without using calculator $\frac{\tan 85^0-\tan 40^0}{1+\tan 85^0 \tan 40^0}$. **(S-16)**

Q.30) In any ΔABC, prove that $\tan A + \tan B + \tan C = \tan A \tan B \tan C$. **(W-14)**

Q.31) Prove that $\frac{\cos 21^0-\sin 21^0}{\cos 21^0+\sin 21^0} = \cot 66^0$ **(S-11)**

Multiple Angles:

If θ is any angle then integral multiples of θ such as $2\theta, 3\theta, \ldots\ldots$ are known as multiple angles.

Sub-Multiple Angles:

Angles of the form $\frac{\theta}{2}, \frac{3\theta}{2}, \ldots \ldots$ are called Sub-Multiple Angles.

Sr. No	Multiple Angle Formulae	Sub-Multiple Angle Formulae
1)	$\sin 2A = 2\sin A \cos A$	$\sin A = 2\sin\frac{A}{2}\cos\frac{A}{2}$
2)	$\sin 2A = \frac{2\tan A}{1+\tan^2 A}$	$\sin A = \frac{2\tan\frac{A}{2}}{1+\tan^2\frac{A}{2}}$
3)	$\cos 2A = \cos^2 A - \sin^2 A$	$\cos A = \cos^2\frac{A}{2} - \sin^2\frac{A}{2}$
4)	$\cos 2A = 2\cos^2 A - 1$	$\cos A = 2\cos^2\frac{A}{2} - 1$
5)	$\cos 2A = 1 - 2\sin^2 A$	$\cos A = 1 - 2\sin^2\frac{A}{2}$
6)	$\cos 2A = \frac{1-\tan^2 A}{1+\tan^2 A}$	$\cos A = \frac{1-\tan^2\frac{A}{2}}{1+\tan^2\frac{A}{2}}$

7)	$\tan 2A = \frac{2\tan A}{1-\tan^2 A}$	$\tan A = \frac{2\tan\frac{A}{2}}{1-\tan^2\frac{A}{2}}$
8)	$1+\cos 2A = 2\cos^2 A$	$1+\cos A = 2\cos^2\frac{A}{2}$
9)	$1-\cos 2A = 2\sin^2 A$	$1-\cos A = 2\sin^2\frac{A}{2}$
10)	$\sin 3A = 3\sin A - 4\sin^3 A$	
11)	$\cos 3A = 4\cos^3 A - 3\cos A$	
12)	$\tan 3A = \frac{3\tan A - \tan^3 A}{1-3\tan^2 A}$	

Q.32) If $A = 30^0$, verify that (i) $\sin 2A = 2\sin A\cos A$ (ii) $\cos 2A = \frac{1-\tan^2 A}{1+\tan^2 A}$. **(W-17)**

Q.33) If $A = 30^0$, verify that $\sin 3A = 3\sin A - 4\sin^3 A$ **(W-08, S-10)**

Q.34) If $\sin A = \frac{3}{5}$, find the value of $\sin 3A$ **(W-09)**

Q.35) If $\sin A = \frac{1}{2}$, find the value of $\sin 3A$ **(S-14, S-17, W-17)**

Q.36) If $\sin\alpha = 0.4$, find the value of $\sin 3\alpha$ **(W-14)**

Q.37) If $\cos\alpha = 0.4$, find the value of $\cos 3\alpha$ **(W-13)**

Q.38) If $\tan\left(\frac{A}{2}\right) = \frac{1}{\sqrt{3}}$, find the value of $(i)\cos A$. **(S.Q.P)**
$(ii)\sin A$ **(W-16, S-17)**

Q.39) If $\tan\frac{\theta}{2} = \frac{2}{3}$, find the value of $2\sin\theta + 3\cos\theta$. **(S-18)**

Q.40) Prove that $\frac{\sin 4\theta+\sin 2\theta}{1+\cos 2\theta+\cos 4\theta} = \tan 2\theta$. **(S-18)**

Q.41) Prove $\frac{1+\sin 2A+\cos 2A}{1+\sin 2A-\cos 2A} = \cot A$. **(S.Q.P)**

Q.42) Prove $\sin A\,.\sin(60-A)\,.\sin(60+A) = \frac{1}{4}\sin 3A$. **(W-18)**

Q.43) Show that $\frac{\cos 3A}{\cos A} + \frac{\sin 3A}{\sin A} = 4\cos 2A$ **(W-14)**

Q.44) Prove that $\frac{\sin A - \sin 3A}{\sin^2 A - \cos^2 A} = 2\sin A$ **(W-12)**

Q.45) Prove that $\sqrt{2+\sqrt{2+2\cos 4\theta}} = 2\cos\theta$ **(S-14)**

Q.46) Prove that $\frac{\sec 4A - 1}{\sec 2A - 1} = \frac{\tan 4A}{\tan A}$ **(W-13, W-15)**

Q.47) Prove that $4\cos A\cos(60^0 - A)\cos(60^0 + A) = \cos 3A$ **(S-10)**

Q.48) Prove that $\tan A\tan(60^0 - A)\tan(60^0 + A) = \tan 3A$
(W-10, W-15, S-17, W-19)

Q.49) Prove that $\frac{\cos A}{1+\cos A} = \frac{1}{2}\left[1 - \tan^2\frac{A}{2}\right]$ **(W-11)**

Q.50) Prove that $\frac{1+\sin A - \cos A}{1+\sin A+\cos A} = \tan\frac{A}{2}$ **(S-19)**

MCQ Question

(Total number of Question=Marks*3=14*3=42)

Note: Correct answer is marked with **bold.**

1 The value of $\sin(45^0 + A)\cos(45^0 - B) + \cos(45^0 + A)\sin(45^0 - B)$

a) Cos (A-B) b) Cos (A+B)

c) Sin (A-B) d) Sin (A+B)

2 If $\sin t = 0.6$, then $\sin(2t) = ?$

a) -0.96 b) 0.48

c) 0.96 d) -0.48

3 If $\tan x = 5$, then $\tan 2x = ?$

a) 10 b) $\frac{-5}{12}$

c) $\frac{1}{10}$ d) $\frac{5}{12}$

4 If $\cos t = \frac{3}{4}$, and $\sin t < 0$, then $\sin 3t = ?$

a) $\frac{\sqrt{7}}{16}$ **b)** $\frac{-5\sqrt{7}}{16}$

c) $\frac{-3\sqrt{7}}{4}$ d) $\frac{5\sqrt{7}}{16}$

5 If $\cos t = 0.8$, then $\cos(2t) = ?$

a) 0.28 b) 0.4

c) 1.0 d) 1.6

6 In ΔABC, $\tan A - \tan B - \tan C = ?$

a) $\tan A \tan B \tan C$ b) $-\tan A \tan B \tan C$

c) $\tan A \tan B - \tan A \tan C - \tan B \tan C$ d) $\tan A + \tan B + \tan C$

7 If $\sin x = \frac{15}{17}$ and $\cos y = \frac{12}{13}, 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2}$, find the value of $\sin(x + y)$

a) $\frac{220}{221}$ b) $\frac{180}{221}$

c) $\frac{-220}{221}$ d) $\frac{-180}{221}$

8 Without using calculator, find the value of $\cos 15^0$

a) $\frac{\sqrt{3}}{2\sqrt{2}}$ b) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

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

9 Without using calculator, find the value of $\sin 75^0$

a) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ b) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

c) $\frac{1}{2\sqrt{2}}$ d) None of these

10 Without using calculator, find the value of $\tan(105^0)$

a) $\frac{\sqrt{3}+1}{1-\sqrt{3}}$ b) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

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

11 If A and B are acute angles, $\sin A = \frac{3}{5}, \cos B = \frac{12}{13}$, find $\cos(A+B)$

a) $\frac{-30}{65}$ b) $\frac{20}{65}$

c) $\frac{36}{65}$ d) $\frac{33}{65}$

12 Find $\cos(x-y)$, given that $\cos x = \frac{-4}{5}$ with $\pi < x < \frac{3\pi}{2}$ and $\sin y = \frac{-24}{25}$ with $\pi < y < \frac{3\pi}{2}$

a) $\frac{-44}{125}$ **b)** $\frac{4}{5}$

c) $\frac{44}{125}$ d) $\frac{-4}{5}$

13 Find $\sin(x-y)$, given that $\sin x = \frac{8}{17}$ with $0 < x < \frac{\pi}{2}$ and $\cos y = \frac{-24}{25}$ with $\pi < y < \frac{3\pi}{2}$

a) $\frac{-87}{425}$ b) $\frac{192}{425}$

c) $\frac{87}{425}$ d) $\frac{-105}{425}$

14 Without using calculator, find the value of $\sec(3660^0)$

a) 2 b) 3

c) 4 d) None of these

15 Without using calculator, find the value of $\cos(570^0)\sin(510^0) + \sin(-330^0)\cos(-390^0)$

a) -2 b) 2

c) 0 d) 1

16 If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, find the value of $\tan(A+B)$

a) 1 b) -1

c) 0 d) 2

17 $\tan\left(\frac{\pi}{4} + A\right) = ?$

a) $\frac{\cos A-\sin A}{\cos A+\sin A}$ **b)** $\frac{\cos A+\sin A}{\cos A-\sin A}$

c) $\frac{-\cos A-\sin A}{\cos A-\sin A}$ d) $\frac{\cos A-\sin A}{\sin A\cos A}$

18 Without using calculator, find the value of $\sin(-330^0)$

a) $\frac{1}{2}$ b) $\frac{-1}{2}$

c) $\frac{\sqrt{3}}{2\sqrt{2}}$ d) $\frac{-\sqrt{3}}{2\sqrt{2}}$

19 Without using calculator, find the value of $\cos(-765^0)$

a) $\frac{\sqrt{3}}{2}$ b) $\frac{-1}{2}$

c) $\frac{1}{2}$ **d)** $\frac{1}{\sqrt{2}}$

20 $\cos(180^0-\theta)$ =?

a) $-\cos\theta$ b) $\cos\theta$

c) $\sin\theta$ d) $-\sin\theta$

21 $\cos(270^0+\theta)$ =?

a) $\cos\theta$ b) $-\sin\theta$

c) -$\cos\theta$ **d)** $\sin\theta$

22 If ∠A and ∠B are obtuse angles and $\sin A=\frac{12}{13}, \cos B=\frac{-4}{5}$, find $\cos(A+B)$

a) $\frac{5}{13}$ b) $\frac{3}{5}$

c) $\frac{56}{65}$ **d)** $\frac{-16}{65}$

23 Without using calculator, find the value of
$\sin 22^0\cos 38^0+\cos 22^0\sin 38^0$

a) $\frac{\sqrt{3}}{2}$ b) $\frac{-\sqrt{3}}{2}$

c) $\frac{1}{2}$ d) None of these

24 If $\cos A=\frac{-3}{5}, \sin B=\frac{20}{29}$, where A and B are the angles in the third and second quadrant respectively. Find $\tan(A+B)$

a) $\frac{-17}{145}$ **b)** $\frac{24}{143}$

c) $\frac{24}{145}$ d) $\frac{143}{145}$

25 Evaluate without using calculator $\frac{\tan 32^0+\tan 88^0}{1-\tan 32^0\tan 88^0}$

a) $-\sqrt{3}$ b) $\sqrt{3}$

c) 1 d) -1

26 Evaluate without using calculator $\frac{\tan 85^0 - \tan 40^0}{1+\tan 85^0 \tan 40^0}$

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

27 Find the value of $\sin\left(A+\frac{\pi}{6}\right) - \sin\left(A-\frac{\pi}{6}\right) = ?$

a) cos A b) sin A
c) -cos A d) -sin A

28 Given $\tan(A+B) = \frac{3}{4}, \tan(A-B) = \frac{77}{36}$, find $\tan 2A$

a) $\frac{26}{9}$ **b)** $\mathbf{\frac{-416}{87}}$
c) $\frac{29}{48}$ d) None of these

29 If A and B are obtuse angles and $\sin A = \frac{5}{13}$ and $\cos B = \frac{-4}{5}$, then find $\sin(A+B)$

a) $\frac{-56}{65}$ **b)** $\mathbf{\frac{16}{65}}$
c) $\frac{33}{65}$ d) $\frac{63}{65}$

30 If $\sin A = \frac{1}{2}$, find $\sin 3A$

a) -1 b) 0
c) 1 d) None of these

31 If $\cos\alpha = 0.4$, find $\cos 3\alpha$

a) -0.944 b) 0.944
c) 0.68 d) None of these

32 If $\sin A = 0.4$, find $\cos 2A$ using multiple angle formula

a) -0.68 b) 0.3125
c) 0.68 d) None of these

33 Find $\cot\left(\frac{\pi}{4}+\theta\right).\cot\left(\frac{\pi}{4}-\theta\right)$

a) 0 b) -1
c) 1 d) None of these

34 Find $\sin\alpha$, if $\tan\left(\frac{\alpha}{2}\right) = \frac{1}{\sqrt{3}}$

a) $\mathbf{\frac{\sqrt{3}}{2}}$ b) $\frac{1}{2}$
c) $\frac{-\sqrt{3}}{2}$ d) $\frac{-1}{2}$

35 If $\tan\frac{\theta}{2} = \frac{2}{3}$, find the value of $2\sin\theta + 3\cos\theta$

a) 6 b) -3
c) 3 d) -6

36 Find $\tan A$, if $\tan\frac{A}{2} = 0.6$

a) 1.875 b) -1.875
c) 3.875 d) -3.875

37 If $\tan A = \frac{1}{2}, \tan B = \frac{1}{3}$, find the value of $\tan(2A + B)$

a) 7 b) 9
c) 3 d) 5

38 If $\tan A = 3$ and $\tan B = 2$, find the value of $\tan(2A + B)$

a) $\frac{-1}{2}$ **b) $\frac{1}{2}$**
c) $\frac{3}{2}$ d) None of these

39 If $\sin A = 0.4$, find the value of $\cos 3A$

a) 0.3297 b) 0.3125
c) 0.9444 d) None of these

40 If $\tan\frac{x}{2} = 0.2$, find $\cos x$

a) -0.9230 b) 0.9444
c) 0.9230 d) None of these

41 $\sin(A + B)\sin(A - B) =$?

a) $\sin^2 A - \sin^2 B$ b) $\cos^2 A - \cos^2 B$
c) $\sin^2 A + \sin^2 B$ d) $\cos^2 A + \cos^2 B$

42 $\cos(A + B)\cos(A - B) =$?

a) $\cos^2 A - \cos^2 B$ b) $\cos^2 B - \cos^2 A$
c) **$\cos^2 A - \sin^2 B$** d) None of these

43 $\cos A \cos B - \sin A \sin B =$?

a) sin (A-B) **b) cos (A+B)**
c) cos (A-B) d) sin (A+B)

44 $\cos(A - B) =$?

a) sinAcosB-cosAsinB b) cosAcosB-sinAsinB
c) sinAcosB+cosAsinB **d) cosAcosB+sinAsinB**

45 $\sin(A - B) =$?

a) sinAcosB-cosAsinB b) cosAcosB-sinAsinB
c) sinAcosB+cosAsinB d) cosAcosB+sinAsinB

46 $\sin(A + B) =$?

a) sinAcosB-cosAsinB b) cosAcosB-sinAsinB
c) sinAcosB+cosAsinB d) cosAcosB+sinAsinB

6. Factorization and Defactorization Formulae

Position in Question Paper **Total Marks-08**

Q.3. c) 4-Marks.

Q.3. d) 4-Marks.

Descriptive Question

Factorization:

The process of conversion from sum/difference into product is known as Factorization.

Defactorization:

The process of conversion from product of terms into sum/difference of terms is known as Defactorization.

Defactorization Formulae:

1)	$2\sin A\cos B = \sin(A+B) + \sin(A-B)$
2)	$2\cos A\sin B = \sin(A+B) - \sin(A-B)$
3)	$2\cos A\cos B = \cos(A+B) + \cos(A-B)$
4)	$2\sin A\sin B = \cos(A-B) - \cos(A+B)$

Factorization Formulae:

1)	$\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$
2)	$\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$
3)	$\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$
4)	$\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right)\sin\left(\frac{D-C}{2}\right)$

Q.1) Prove that $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$. **(S-18)**

Q.2) Prove that $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$.
(W-17, S-17, W-18, W-19)

Q.3) Prove that $\frac{\cos 2A + 2\cos 4A + \cos 6A}{\cos A + 2\cos 3A + \cos 5A} = \cos A - \sin A \tan 3A$. **(S-19)**

Q.4) Show that $\frac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = \tan\left(\frac{5A}{2}\right)$. **(W-16)**

Q.5) Prove that $\frac{\sin 8x - \sin 5x}{\cos 7x + \cos 6x} = \sin x + \cos x \tan\frac{x}{2}$. **(S-15)**

Q.6) Prove that $\frac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A \tan 3A$.
(W-14)

Q.7) Prove that $\frac{\sin A + 2\sin 2A + \sin 3A}{\cos A + 2\cos 2A + \cos 3A} = \tan 2A$. **(S-14)**

Q.8) Prove that $\frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \cot x$. **(W-13)**

Q.9) Prove that $\cos 20 \cos 40 \cos 60 \cos 80 = \frac{1}{16}$. **(W-17, W-18, S-18, W-19)**

Q.10) Prove that $\sin 20^0 \sin 40^0 \sin 60^0 \sin 80^0 = \frac{3}{16}$.
(W-13, S-14, W-15, S-16, S-19)

Q.11) Show that $\sin 50^0 - \sin 70^0 + \sin 10^0 = 0$. **(S-17)**

Q.12) Without using calculator, show that $\frac{\sin(19^0)+\cos(11^0)}{\cos(19^0)-\cos(11^0)} = \sqrt{3}.$ **(S.Q.P)**

Q.13) Prove that $\frac{\sin 8\theta \cos\theta - \cos 3\theta \sin 6\theta}{\cos 2\theta \cos\theta - \sin 3\theta \sin 4\theta} = \tan 2\theta$ **(S-11)**

Q.14) Prove that $\frac{\sin A + 2\sin 3A + \sin 5A}{\sin 3A + 2\sin 5A + \sin 7A} = \cos 2A - \cot 5A \sin 2A$ **(S-11)**

Q.15) Prove that $\sin 10^0 \sin 30^0 \sin 50^0 \sin 70^0 = \frac{1}{16}.$ **(W-16)**

MCQ Question

(Total number of Question=Marks*3=8*3=24)

Note: Correct answer is marked with **bold.**

1 Process of conversion of sum or difference into product is known as

a) Factorization b) De-factorization
c) Both of these d) None of these

2 Process of conversion of product into sum or difference is known as

a) Factorization **b) De-factorization**
c) Both of these d) None of these

3 Formula of $\sin C + \sin D$ is

a) $\mathbf{2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)}$ b) $2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

c) $2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ d) $2\sin\left(\frac{C-D}{2}\right)\sin\left(\frac{D-C}{2}\right)$

4 Formula of $\sin C - \sin D$ is

a) $2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ **b)** $\mathbf{2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)}$

c) $2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ d) $2\sin\left(\frac{C-D}{2}\right)\sin\left(\frac{D-C}{2}\right)$

5 Formula of $\cos C + \cos D$ is

a) $2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ b) $2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

c) $\mathbf{2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)}$ d) $2\sin\left(\frac{C-D}{2}\right)\sin\left(\frac{D-C}{2}\right)$

6 Formula of $\cos C - \cos D$ is

a) $2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ b) $2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

c) $2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$ **d)** $\mathbf{2\sin\left(\frac{C-D}{2}\right)\sin\left(\frac{D-C}{2}\right)}$

7 $\sin 75^0 + \sin 15^0 = ?$

a) $\mathbf{\frac{\sqrt{3}}{\sqrt{2}}}$ **b)** $\mathbf{\frac{\sqrt{3}}{2}}$

c) $\frac{1}{\sqrt{2}}$ d) None of these

8 Find the value of $\cos 52^0 + \cos 68^0 + \cos 172^0$

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

9 Formula of $2\sin A\cos B$ is

a) **sin(A+B) + sin(A-B)**
b) sin(A+B) - sin(A-B)
c) cos(A+B) + cos(A-B)
d) cos(A-B) - cos(A+B)

10 Formula of $2\cos A\, sinB$ is

a) sin(A+B) + sin(A-B)
b) **sin(A+B) - sin(A-B)**
c) cos(A+B) + cos(A-B)
d) cos(A-B) - cos(A+B)

11 Formula of $2\cos A\cos B$ is

a) sin(A+B) + sin(A-B)
b) sin(A+B) - sin(A-B)
c) **cos(A+B) + cos(A-B)**
d) cos(A-B) - cos(A+B)

12 Formula of $2\sin A\, sinB$ is

a) sin(A+B) + sin(A-B)
b) sin(A+B) - sin(A-B)
c) cos(A+B) + cos(A-B)
d) **cos(A-B) - cos(A+B)**

13 Write $\cos 7x\cos 4x$ as a sum

a) cos11x + cos3x
b) cos11x – cos3x
c) $\mathbf{\frac{1}{2}[\cos(11x)+\cos(3x)]}$
d) None of these

14 Express as sum or difference $\sin 55^0 \sin 40^0$

a) $\frac{1}{2}[\sin(15^0)-\sin(95^0)]$
b) $\mathbf{\frac{1}{2}[\cos(15^0)-\cos(95^0)]}$
c) $\frac{1}{2}[\cos(15^0)+\cos(95^0)]$
d) None of these

15 $\dfrac{\sin 4A+\sin 5A+\sin 6A}{\cos 4A+\cos 5A+\cos 6A}=?$

a) tan 4A
b) tan 5A
c) tan 6A
d) None of these

16 Find the value of $\frac{\sin 3A-\sin A}{\cos 3A+\cos A}$

a) tanA
b) cosA
c) sinA
d) cotA

17 Find the value of $\frac{\sin 8x+\sin 2x}{\cos 2x-\cos 8x}$

a) tan3x
b) cot3x
c) sin3x
d) cos3x

18 $\dfrac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = ?$

a) $\tan 2A$ b) $\cot\left(\frac{5A}{2}\right)$

c) $\tan\left(\frac{5A}{2}\right)$ d) $\cot 2A$

19 If $2\cos 70^0 \sin 50^0 = \sin A - \sin B$, find angle A and B

a) $A = 20^0, B = 120^0$ **b) $A = 120^0, B = 20^0$**

c) $A = 70^0, B = 50^0$ d) $A = 50^0, B = 70^0$

20 If $\sin 80^0 + \sin 50^0 = 2\sin\alpha\cos\beta$, find α and β

a) $A = 15^0, B = 65^0$ b) $A = 80^0, B = 50^0$

c) $A = 65^0, B = 15^0$ d)None of these

21 Express $\cos 4\theta + \cos 8\theta$ as product

a) $2\cos 6\theta \cos 2\theta$ b) $2\cos 2\theta \cos 6\theta$

c) $2\sin 4\theta \sin 8\theta$ d) None of these

22 Evaluate $\sin 50^0 - \sin 70^0 + \sin 10^0$

a) -1 **b) 0**

c) 1 d) None of these

23 Express $4\cos 30^0 \sin 20^0$ as the sum or difference of trigonometric ratios

a) $[\cos 50^0 - \cos 10^0]$ b) $2[\sin 30^0 - \sin 20^0]$

c) $2[\sin 50^0 - \sin 10^0]$ d) None of these

24 Without using calculator, evaluate $\sin 20^0 \sin 40^0 \sin 60^0 \sin 80^0$

a) $\frac{3}{16}$ b) $\frac{\sqrt{3}}{2}$

c) $\frac{5}{16}$ d) $\frac{3}{2}$

25 Without using calculator, evaluate $\cos 20^0 \cos 40^0 \cos 60^0 \cos 80^0$

a) $\frac{3}{16}$ b) $\frac{\sqrt{3}}{2}$

c) $\frac{1}{16}$ d) $\frac{3}{2}$

7. Inverse Trigonometric Ratios

Position in Question Paper **Total Marks-08**

Q.4. c) 4-Marks.
Q.4. d) 4-Marks.

Descriptive Question

Definition:

If $-1 \leq x \leq 1$ and $= \sin\theta$, where $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$, then θ is called inverse sine of x and is written as $\theta = \sin^{-1} x$.

This is read as "sine inverse x equals θ"

Examples: -

$(i)\ \sin 45^0 = \frac{1}{\sqrt{2}} \quad \therefore \sin^{-1}\left(\frac{1}{\sqrt{2}}\right) = 45^0\ or\ \frac{\pi}{4}$

$(ii)\ \sin 60^0 = \frac{\sqrt{3}}{2} \quad \therefore \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = 60^0\ or\ \frac{\pi}{3}$

$(iii)\ \tan 60^0 = \sqrt{3} \quad \therefore \tan^{-1}(\sqrt{3}) = 60^0 or\ \frac{\pi}{3}$

$(iv)\ \cos 60^0 = \frac{1}{2} \quad \therefore \cos^{-1}\left(\frac{1}{2}\right) = 60^0 or\ \frac{\pi}{3}$

Properties of inverse trigonometric functions:

Property 1:

$(i)\sin^{-1}(\sin\theta) = \theta$	$(i)\ \sin(\sin^{-1} x) = x$
$(ii)cos^{-1}(\cos\theta) = \theta$	$(ii)\cos(cos^{-1} x) = x$
$(iii)tan^{-1}(\tan\theta) = \theta$	$(iii)\tan(tan^{-1} x) = x$
$(iv)\ cot^{-1}(\cot\theta) = \theta$	$(iv)\cot(cot^{-1} x) = x$
$(v)\ cosec^{-1}(\text{cosec}\,\theta) = \theta$	$(v)\text{cosec}(cosec^{-1} x) = x$
$(vi)\ sec^{-1}(\sec\theta) = \theta$	$(vi)\ \sec(sec^{-1} x) = x$

Property 2:

$(i) cosec^{-1}(x) = \sin^{-1}\left(\frac{1}{x}\right)$	$(iv)\ \sin^{-1}(x) = \text{cosec}^{-1}\left(\frac{1}{x}\right)$
$(ii) sec^{-1}(x) = \cos^{-1}\left(\frac{1}{x}\right)$	$(v)\ \cos^{-1}(x) = \sec^{-1}\left(\frac{1}{x}\right)$
$(iii) cot^{-1}(x) = \tan^{-1}\left(\frac{1}{x}\right)$	$(vi)\ \tan^{-1}(x) = \cot^{-1}\left(\frac{1}{x}\right)$

Property 3:

$(i) sin^{-1}(-x) = -\sin^{-1}(x)$	$(iv)\ cosec^{-1}(x) = -\text{cosec}^{-1}(x)$
$(ii) cos^{-1}(-x) = \pi - \cos^{-1}(x)$	$(v)\ sec^{-1}(-x) = \pi - \sec^{-1}(x)$
$(iii) tan^{-1}(-x) = -\tan^{-1}(x)$	$(vi)\ cot^{-1}(-x) = -\cot^{-1}(x)$

Property 4:

$(i)\ \sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$
$(ii)\ \text{cosec}^{-1} x + \sec^{-1} x = \frac{\pi}{2}$
$(iii)\ \tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$

Property 5:

$(i) If\ x > 0, y > 0\ and\ xy < 1, then$ $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left[\frac{x+y}{1-xy}\right]$
$(ii) If\ x > 0, y > 0\ and\ xy > 1, then$ $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left[\frac{x+y}{1-xy}\right] + \pi$
$(iii) If\ x > 0, y > 0\ , then$ $\tan^{-1} x - \tan^{-1} y = \tan^{-1}\left[\frac{x-y}{1+xy}\right]$

Property 6:

$2\tan^{-1} x = \sin^{-1}\left[\frac{2x}{1+x^2}\right] = \cos^{-1}\left[\frac{1-x^2}{1+x^2}\right] = \tan^{-1}\left[\frac{2x}{1-x^2}\right]$

Property 7:

$(i)\ \sin^{-1}x = \cos^{-1}\left(\sqrt{1-x^2}\right) = \tan^{-1}\left[\frac{x}{\sqrt{1-x^2}}\right]$ $= \sec^{-1}\left(\frac{1}{\sqrt{1-x^2}}\right) = \cot^{-1}\left[\frac{\sqrt{1-x^2}}{x}\right] = \operatorname{cosec}^{-1}\left(\frac{1}{x}\right)$
$(ii)\ cos^{-1}x = sin^{-1}\left(\sqrt{1-x^2}\right) = \tan^{-1}\left[\frac{x}{\sqrt{1-x^2}}\right]$ $= cosec^{-1}\left(\frac{1}{\sqrt{1-x^2}}\right) = \cot^{-1}\left[\frac{\sqrt{1-x^2}}{x}\right] = \sec^{-1}\left(\frac{1}{x}\right)$

Property 8:

$(i)\ \sin^{-1}x + \sin^{-1}y = \sin^{-1}\left[x\sqrt{1-y^2} + y\sqrt{1-x^2}\right]$
$(ii)\ \sin^{-1}x - \sin^{-1}y = \sin^{-1}\left[x\sqrt{1-y^2} - y\sqrt{1-x^2}\right]$
$(iii)\ \cos^{-1}x + \cos^{-1}y = \cos^{-1}\left[xy - \sqrt{1-x^2}\sqrt{1-y^2}\right]$
$(iv)\ \cos^{-1}x - \cos^{-1}y = \cos^{-1}\left[xy + \sqrt{1-x^2}\sqrt{1-y^2}\right]$

Q.1) If $\tan^{-1}(1) + \tan^{-1}(x) = 0$, find the value of x. **(W-13, S-17)**

Q.2) Show that $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$. **(S-17, S-19)**

Q.3) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$. **(S-17, W-17, W-18)**

Q.4) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$. **(S-19)**

Q.5) $\tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$. **(S-16, W-16)**

Q.6) Show that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$. **(S-16)**

Q.7) Prove that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$. **(S-16, W-19)**

Q.8) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$. **(S-15, W-15)**

Q.9) Prove that $2\cot^{-1}(3) + \operatorname{cosec}^{-1}\left(\frac{5}{4}\right) = \frac{\pi}{2}$. **(W-14)**

Q.10) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \cos^{-1}\left(\frac{5}{13}\right) = \cos^{-1}\left(\frac{56}{65}\right)$. **(S-13)**

Q.11) Prove that $\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right) = \tan^{-1}(\infty)$ **(W-09)**

Q.12) Prove that $2\tan^{-1}\left(\frac{1}{3}\right) = \tan^{-1}\left(\frac{3}{4}\right)$ **(S-07)**

Q.13) Prove that $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)=\cot^{-1}(2)$ **(S-18)**

Q.14) Prove that $\tan^{-1}\left(\frac{2}{11}\right)+\tan^{-1}\left(\frac{7}{24}\right)=\cot^{-1}(2)$ **(S-10)**

Q.15) Prove that
$\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)=\tan^{-1}\left(\frac{2}{9}\right)=\cot^{-1}\left(\frac{9}{2}\right)$ **(W-12, S-13, S-14, W-18)**

Q.16) Prove that $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{33}{65}\right)=\sin^{-1}\left(\frac{56}{65}\right)$ **(W-12, W-18)**

Q.17) Prove that $\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{8}{17}\right)=sin^{-1}\left(\frac{84}{85}\right)$. **(S-13)**

Q.18) Prove that $\cos^{-1}\left(\frac{4}{5}\right)-\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{63}{65}\right)$. **(S-17)**

Q.19) Prove that $\cos^{-1}\left(\frac{4}{5}\right)-sin^{-1}\left(\frac{5}{13}\right)=\cos^{-1}\left(\frac{63}{65}\right)$. **(S-11, S-13)**

MCQ Question

(Total number of Question=Marks*3=8*3=24)

Note: Correct answer is marked with **bold.**

1. The value of $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{7}{8}\right)$ is

a) $\tan^{-1}\left(\frac{7}{8}\right)$
b) $\cot^{-1}(15)$
c) $\tan^{-1}(15)$
d) $\tan^{-1}\left(\frac{25}{24}\right)$

2. The value of $\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{1}{7}\right)$ is

a) π
b) $\frac{\pi}{2}$
c) $\frac{3\pi}{4}$
d) $\frac{\pi}{4}$

3. If $\tan^{-1}(\cot\theta)=2\theta$, then θ is equal to

a) $\frac{\pi}{3}$
c) $\frac{\pi}{6}$
b) $\frac{\pi}{4}$
d) None of these

4. If $\tan^{-1}3+\tan^{-1}x=\tan^{-1}8$, then x =?

a) 5
b) $\frac{1}{5}$
c) $\frac{5}{14}$
d) $\frac{14}{5}$

5. $\sin^{-1}\left(\frac{-1}{2}\right)$

a) $\frac{\pi}{3}$

c) $\frac{\pi}{6}$

b) $\frac{-\pi}{3}$

d) $\boldsymbol{\frac{-\pi}{6}}$

6. $\cos^{-1}\left(\frac{1}{2}\right)$

a) $\frac{-\pi}{3}$

b) $\boldsymbol{\frac{\pi}{3}}$

c) $\frac{\pi}{2}$

d) $\frac{2\pi}{3}$

7. $\tan^{-1}(\sqrt{3})$

a) $\frac{\pi}{6}$

b) $\boldsymbol{\frac{\pi}{3}}$

c) $\frac{2\pi}{3}$

d) $\frac{5\pi}{6}$

8. $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

a) $\boldsymbol{\frac{\pi}{4}}$

b) $\frac{\pi}{3}$

c) $\frac{\pi}{6}$

d) $\frac{\pi}{2}$

9. $\tan^{-1}(1) + \cos^{-1}\left(\frac{-1}{2}\right) + \sin^{-1}\left(\frac{-1}{2}\right)$

a) $\frac{2\pi}{3}$

b) $\boldsymbol{\frac{3\pi}{4}}$

c) $\frac{\pi}{2}$

d) 6π

10. $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$ is equal to

a) $\frac{\pi}{4}$

b) $\frac{\pi}{6}$

c) $\frac{\pi}{3}$

d) $\boldsymbol{\frac{2\pi}{3}}$

11. $\sin^{-1}\left\{2\cos^{-1}\left(\frac{-3}{5}\right)\right\}$

a) $\frac{6}{25}$

b) $\frac{24}{25}$

c) $\frac{4}{5}$

d) $\boldsymbol{\frac{-24}{25}}$

12. $\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{5}\right)+\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{8}\right)$

a) π b) $\frac{\pi}{2}$

c) $\boldsymbol{\frac{\pi}{4}}$ d) $\frac{3\pi}{4}$

13. If $\tan^{-1}x-\tan^{-1}y=\tan^{-1}A$, then A is equal to

a) x – y b) x + y

c) $\boldsymbol{\frac{x-y}{1+xy}}$ d) $\frac{x+y}{1-xy}$

14. The value of $\sin\left[\cos^{-1}\left(\frac{7}{25}\right)\right]$ is

a) $\frac{25}{24}$ b) $\frac{25}{7}$

c) $\boldsymbol{\frac{24}{25}}$ d) $\frac{7}{24}$

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

a) $\boldsymbol{\frac{\pi}{4}}$ b) $\frac{\pi}{2}$

c) $\frac{\pi}{3}$ d) π

16. $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)$ equal to

a) $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$ b) $\frac{1}{2}\sin^{-1}\left(\frac{3}{2}\right)$

c) $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$ **d)** $\boldsymbol{\tan^{-1}\left(\frac{1}{2}\right)}$

17. $\cos^{-1}\left(\frac{4}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=$?

a) $\boldsymbol{\cos^{-1}\left(\frac{33}{65}\right)}$ b) $\cos^{-1}\left(\frac{36}{65}\right)$

c) $\sin^{-1}\left(\frac{33}{65}\right)$ d) None of these

18. $\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)$ equal to

a) $\cos^{-1}\left(\frac{2}{9}\right)$ **b)** $\boldsymbol{\cos^{-1}\left(\frac{9}{2}\right)}$

c) $\sin^{-1}\left(\frac{2}{9}\right)$ d) None of these

19. $\sin^{-1}\left(\frac{3}{5}\right)-\sin^{-1}\left(\frac{8}{17}\right)=$?

a) $\boldsymbol{\cos^{-1}\left(\frac{84}{85}\right)}$ b) $\cos^{-1}\left(\frac{85}{84}\right)$

c) $\sin^{-1}\left(\frac{87}{84}\right)$ d) None of these

20. $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)$ equal to

a) $\frac{\pi}{3}$ **b)** $\boldsymbol{\frac{\pi}{4}}$

c) $\frac{\pi}{6}$ d) $\frac{\pi}{2}$

21. $\tan^{-1}(1)+\tan^{-1}(2)+\tan^{-1}(3)=?$

a) $\boldsymbol{\pi}$ b) $\frac{\pi}{6}$

c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

22. $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=?$

a) $\boldsymbol{\sin^{-1}\left(\frac{56}{65}\right)}$ b) $\cos^{-1}\left(\frac{53}{65}\right)$

c) $\cos^{-1}\left(\frac{43}{65}\right)$ d) None of these

23. $\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{3}{5}\right)-\tan^{-1}\left(\frac{8}{19}\right)=?$

a) π b) $\frac{\pi}{2}$

c) $\boldsymbol{\frac{\pi}{4}}$ d) None of these

24. $\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{8}{17}\right)=?$

a) $\boldsymbol{\sin^{-1}\left(\frac{84}{85}\right)}$ b) $\cos^{-1}\left(\frac{75}{85}\right)$

c) $\sin^{-1}\left(\frac{43}{85}\right)$ d) None of these

8. Straight Line

Position in Question Paper **Total Marks-12**

Q.5. a. i) 3-Marks.
Q.5. a. ii) 3-Marks.
Q.5. b. i) 3-Marks.
Q.5. b. ii) 3-Marks.

Descriptive Question

Inclination of a line: -

The smallest non-negative angle θ made by a line with positive direction of X-axis is called the inclination of the line.

Slope of a line: -

I) The slope or gradient of a line is defined as the tangent ratio of its inclination provided that the line is not parallel to Y-axis. It is denoted by m.

$m = \tan\theta$

II) **Slope of a line passing through two points:**

Slope of a line passing through two points $A(x_1, y_1)\ and\ B(x_2, y_2)$ is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

III) **Slope of a general line ax+by+c=0 is**

$$m = -\frac{a}{b}$$

Standard Forms of Equation of a Line:

1) **Slope-Point Form: -**

Equation of a line passing through the point $A(x_1, y_1)$ and having slope m is

$y - y_1 = m(x - x_1)$

2) **Slope-Intercept Form: -**

Equation of a line having slope m and Y intercept C is $y = mx + c$

3) **Two-Point Form: -**

Equation of a line passing through two points $A(x_1, y_1)\ and\ B(x_2, y_2)$ is

$$\frac{y-y_1}{y_1-y_2}=\frac{x-x_1}{x_1-x_2}$$

4) Double Intercept Form: -

Equation of a line having X-intercept 'a' and Y-intercept 'b' is $\frac{x}{a}+\frac{y}{b}=1$

5) Parametric Form: -

Equation of a line in Parametric Form is

$$\frac{y-y_1}{\sin\theta}=\frac{x-x_1}{\cos\theta}$$

6) Normal Form: -

Equation of a line in Normal Form is

$x\cos\alpha+y\sin\alpha=p$

Where p = Length of perpendicular from origin.

α = angle made by perpendicular with X-axis.

Q.1) Find the equation of line passing through point (2, 3) and having slope 5 units. **(W-19)**

Q.2) Find the equation of line passing through (1,7)and having slope 2 units. **(S.Q.P, S-19)**

Q.3) Find the equation of straight line passes through the points (3,5)and (4,6). **(W-17)**

Q.4) Find the equation of straight line passes through the points $(-4,6)$ and $(8,-3)$. **(S-14, W-18)**

Q.5) Find the equation of line passing through $(3,-4)$and having slope $\frac{3}{2}$. **(S-18)**

Q.6) Find the intercepts of the line 2x + 3y = 6 on both the axes. **(W-13)**

Q.7) 2x + 3y + 7 = 0 and 2x + 3y – 13 = 0 are two straight lines. Are they parallel to each other? (**W-12)**

Q.8) Prove that the lines 3x – 2y + 6 = 0 and 2x + 3y – 1 = 0 are perpendicular to each other. **(W-12)**

Q.9) Find the value of k if the lines kx – 6y = 9 and 6x + 5y = 13 are perpendicular to each other. **(W-11)**

Q.10) Find P if the lines $3x+4Py+8=0$ and $3Py-9x+10=0$ are perpendicular to each other. **(S-17)**

Q.11) Find the equation of line passing through the point (4,5)

and perpendicular to the line $7x - 5y = 420$. **(S.Q.P, S-19)**

Q.12) Find the equation of line passing through the point (3,4) and perpendicular to the line $2x - 4y + 5 = 0$. **(S-18)**

Q.13) Find the equations of the lines passing through the point (6,5) and parallel to the line having intercepts 2 and 4 on X and Y axis respectively. **(S-15)**

Q.14) Find the equation of the line parallel to $3x - 2y + 5 = 0$ and passing through the point (5, -6) (**S-10)**

Q.15) Find the equation of line passing through the point (3,4) and perpendicular to the line $3x + 2y + 5 = 0$. **(W-13)**

Q.16) Find the equation of the line passing through the point (2, 3) and perpendicular to the line $3x - 5y = 6$ **(W-19)**

Q.17) Find the equation of the line whose intercept on the X axis is double that on the $Y-$ axis and passing through the point (4,1). **(S-17)**

Q.18) Find equation of lines passing through $(12, -4)$ and whose sum of the intercepts is equal to 10. **(W-15)**

Q.19) Find the equation of straight line which is perpendicular bisector of the line joining the points $A(8, -1)$and B(6,3) **(S-17)**

Q.20) Find the equation of the perpendicular bisector of the line joining the points A (-2, 3) and B (8, -1) **(S-12, W-13)**

Q.21) Find the equation of the perpendicular bisector of the line joining the points A (4, 8) and B (-2, 6) **(W-09)**

Intersection of two lines: -

Q.22) Find the equation of the line through the point of intersectionof lines $4x + 3y = 8$ and $x + y = 1$ and parallel to the line $5x - 7y = 3$. **(S-17, W-17)**

Q.23) Find the equation of line passing through the point (2,5) and through the intersection of the lines $x + y = 0$ and $2x - y = 9$. **(W-16, W-18)**

Q.24) Find the equation of the line through the point of intersection of lines $2x + 3y = 13$ and $5x - y - 7 = 0$ and perpendicular to the line $3x - 2y + 7 = 0$. **(W-16)**

Q.25) Find the equation of the line through the point of intersectionof lines $2x + y + 6 = 0$ and $3x + 5y - 15 = 0$ and parallel to the line $5x + 6y + 3 = 0$. **(W-10)**

Q.26) Find the equation of the line passing through the point of intersection of lines

x + y = 0 and 2x – y = 9 and through the point (4,5) **(W-16, W-18)**

Q.27) Find the equation of the line passing through the point of intersection of lines 2x + 3y = 13 and 5x – y = 7 and through the point (1, -1) **(S-11)**

Angle between two lines: -

If θ is the acute angle between the lines with slopes m_1 and m_2, then

$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$

Q.28) Find the acute angle between the lines $y = 5x + 6$ and $y = x$. **(S.Q.P, S-19)**

Q.29) Find the acute angle between the lines $2x + 3y + 5 = 0$ and $x - 2y - 4 = 0$. **(W-12, W-17)**

Q.30) Find the acute angle between the lines $3x + 2y + 4 = 0$ and $2x - 3y - 7 = 0$. **(W-18)**

Q.31) Find the acute angle between the lines $3x - y = 4$ and $2x + y = 3$. **(W-11, S-18, W-19)**

Q.32) Find the acute angle between the lines $2y + x = 1$ and $x + 3y = 6$. **(S-08, W-08)**

Q.33) Find the acute angle between the lines $2x + 3y = 13$ and $2x - 5y + 7 = 0$. **(W-14, S-16)**

Q.34) Find the acute angle between the lines whose slopes are $\sqrt{3}$ *and* $\frac{1}{\sqrt{3}}$ **(W-13)**

Perpendicular distance of a point from the line: -

If p is the length of the perpendicular from a point P (x_1, y_1) to the line ax + by + c =0 then $p = \left|\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right|$

Q.35) Find the length of perpendicular from the point P (2,3) on the line $4x - 6y - 3 = 0$. **(S-19)**

Q.36) Find the length of perpendicular from the point P (5,4) on the line $2x + y = 34$. **(S-18)**

Q.37) Find the length of perpendicular from the point P (2,5) on the line $2x + 3y - 6 = 0$. **(W-19)**

Distance between two parallel lines: -

The distance between two parallel lines $ax+by+c_1=0$ and $ax+by+c_2=0$ is given by

$d = \left|\frac{c_2 - c_1}{\sqrt{a^2 + b^2}}\right|$

Q.38) Find the distance between the parallel lines $3x - y + 7 = 0$ and $3x - y + 16 = 0$. **(W-17)**

Q.39) Find the distance between the lines 3x + 2y = 5 and 6x + 2y = 6 (**S-16)**

Q.40) Find the perpendicular distance between the parallel lines 5x – 12y + 1 = 0 and 10x = 24y + 1 **(W-13, S-14)**

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

1. The equation of the line joining the points (-1, 3) and (4, -2) is
- a) x + y – 1 = 0
- b) x + y + 1 = 0
- c) x + y + 2 = 0
- **d) x + y –2 = 0**

2. The equation of the line through (3, 4) and parallel to the line y = 3x + 5 is
- **a) 3x – y – 5 = 0**
- b) 3x + y – 5 = 0
- c) 3x + y + 5 = 0
- d) 3x - y + 5 = 0

3. The equation of the straight line passing through the point (1,2) and parallel to the y = 3x + 1 is
- a) y + 2 = x + 1
- b) y + 2 = 3x (x + 1)
- **c) y - 2 = 3x (x - 1)**
- d) y – 2 = x – 1

4. The equation of the line passing through the point (2,3) with slope 2 is
- a) 2x + y – 1 = 0
- b) 2x - y + 1 = 0
- **c) 2x - y – 1 = 0**
- d) 2x + y + 1 = 0

5. The angle between the lines x – 2y = 5 and y – 2x = 5 is
- a) $\tan^{-1}\left(\frac{1}{4}\right)$
- b) $\tan^{-1}\left(\frac{3}{5}\right)$
- **c) $\tan^{-1}\left(\frac{5}{4}\right)$**
- d) $\tan^{-1}\left(\frac{2}{3}\right)$

6. The equation of the line through the points (1, 5) and (2, 3) is
- a) 2x - y – 7 = 0
- b) 2x + y + 7 = 0
- **c) 2x + y - 7 = 0**
- d) x – 2y – 7 = 0

7. Two lines are perpendicular if the product of their slopes is
- a) 0
- b) 1
- **c) -1**
- d) None of these

8. Y-intercept of the line 4x – 3y + 15 = 0 is
- a) $\frac{-15}{4}$
- b) $\frac{15}{4}$
- c) -5

d) 5

9. Find the point of intersection of lines x + y = 0 and 2x – y = 9

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

10. The equation of the straight line passing through the point (3,2) and perpendicular to the line y = x is

a) x – y = 5 c) x + y = 1
b) x + y = 5 d) x – y = 1

11. Equation of the line passing through (1, 2) and parallel to the line y = 3x – 1 is

a) y + 2 = x + 1 **c) y - 2 = 3 (x - 1)**
b) y + 2 = 3 (x + 1) d) y - 2 = x – 1

12. Find the distance between lines 3x + 2y = 5 and 6x + 4y = 6

a) 0.981 c) 0.435
b) 0.582 **d) 0.555**

13. Find the acute angle between the lines 3x – y = 4 and 2x + y = 3

a) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$
b) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$

14. Find the point of intersection of lines 4x + 3y = 8 and x + y = 1

a) (-5, -4) **c) (5, -4)**
b) (-5, 4) d) (5, 4)

15. Find the equation of the line passing through (3, -4) and having slope $\frac{3}{2}$

a) 3x – 2y – 17 = 0 **c) 3x – 2y – 17 = 0**
b) 2x – 3y – 17 =0 d) 2x + 3y – 17 = 0

16. Equation of the line passing through (3,4) and perpendicular to the line 2x – 4y + 5 = 0

a) 2x + y – 10 = 0 c) 2x – 4y + 15 = 0
b) 3x – 4y + 10 = 0 d) None of these

17. Find the length of the perpendicular from the point (5,4) on the straight line 2x + 3y = 34

a) 5.29 **c) 8.94**
b) 7.56 d) 4.32

18. Find the acute angle between the lines 3x + 2y + 4 = 0 and 2x – 3y – 7 = 0

a) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$
b) $\frac{\pi}{6}$ d) None of these

19. Find the equation of straight line passes through the points (-4, 6) and (8, -3)

a) 3x – 4y + 12 = 0 b) 3x + 4y + 12 = 0

c) 3x + 4y – 12 = 0 d) None of these

20. Find the acute angle between the lines y = 5x + 6 and y = x

a) $\tan^{-1}\left(\frac{4}{5}\right)$ c) $\tan^{-1}\left(\frac{2}{5}\right)$

b) $\boldsymbol{\tan^{-1}\left(\frac{2}{3}\right)}$ d) None of these

21. Find the length of the perpendicular from the point (2, 3) on the line 4x – 6y – 3 = 0

a) $\frac{13}{\sqrt{62}}$ b) $\frac{13}{\sqrt{65}}$

c) $\frac{13}{\sqrt{55}}$ **d)** $\boldsymbol{\frac{13}{\sqrt{52}}}$

22. Find equation of line passing through (4, 5) and parallel to 2x – 3y – 5 = 0

a) 2x – 3y + 7 = 0 c) 2x - 3y - 7 = 0

b) 2x + 3y + 7 = 0 d) None of these

23. Find the distance between two parallel lines 3x – y + 7 = 0 and 3x – y + 16 = 0

a) $\boldsymbol{\frac{9}{\sqrt{10}}}$ c) $\frac{9}{\sqrt{8}}$

b) $\frac{23}{\sqrt{10}}$ d) $\frac{23}{\sqrt{8}}$

24. Find the acute angle between the lines 3x – 4y = 420 and 4x + 3y = 420

a) $\frac{\pi}{6}$ c) $\frac{\pi}{6}$

b) $\boldsymbol{\frac{\pi}{2}}$ d) None of these

25. Find the equation of a line passing through (2,5) and the point of intersection of x + y = 0 and 2x – y = 9

a) **8x + y = 21** c) x + 8y = 21

b) 8x – y = 21 d) x – 8y = 21

26. Find the X-intercept of the line 2x + 3y = 6

a) 3 c) -3

b) 2 d) -2

27. Find the value of 'k' if the lines kx – 6y = 9 and 6x + 5y = 13 are perpendicular to each other

a) -5 **c) 5**

b) $\frac{1}{5}$ d) $\frac{-1}{5}$

28. Find the equation of the line having X-intercept 2 and Y-intercept 4

a) 2x – y = 4 c) x + 2y = 4

b) 2x + y = 4 d) x – 2y = 4

29. Find the equation of a line whose perpendicular distance from origin is 3 And inclination of perpendicular is 30^0

a) $\sqrt{3}x - y = 6$ b) $x + \sqrt{3}y = 6$

c) $\sqrt{3}x + y = 6$ d) None of these

30. Find the equation of straight line passing through (5,6) and making angle 150^0 with x-axis.

a) $x + \sqrt{3}y = 5 + 6\sqrt{3}$ c) $x - y = 5 - 6\sqrt{3}$

b) $x - \sqrt{3}y = 5 - 6\sqrt{3}$ d) None of these

31. Find K if the slope of a line passing through the points (3, -5) and (K, -1) is $\frac{1}{3}$

a) -15 c) 10

b) 15 d) None of these

32. Find the slope of a line passing through the points (1, 2) and (3, 3)

a) 2 **c)** $\frac{1}{2}$

b) $\frac{-1}{2}$ d) -2

33. Find the Y-intercept of a line $\frac{x}{4} - \frac{y}{3} = 2$

a) -6 c) 24

b) 8 d) None of these

34. Slope of X-axis is

a) Not defined c) 1

b) 0 d) -1

35. Slope of Y-axis is

a) 1 c) 0

b) -1 **d) Not defined**

36. Find the acute angle between the lines 2x + y – 1 = 0 and 3x + y + 4 = 0

a) $\tan^{-1}\left(\frac{1}{7}\right)$ c) $\tan^{-1}\left(\frac{4}{9}\right)$

b) $\tan^{-1}\left(\frac{5}{7}\right)$ d) None of these

9. Mensuration

Position in Question Paper **Total Marks-10**

Q.1. d) 2-Marks.
Q.1. e) 2-Marks.
Q.5. c. i) 3-Marks.
Q.5. c. ii) 3-Marks.

Descriptive Question

Mensuration:

Mensuration is a branch of mathematics, which includes the measurement of lengths of lines, areas of surfaces and volumes of solids.

Mensuration is divided into two groups:

1) **Mensuration of Plane Figures:**

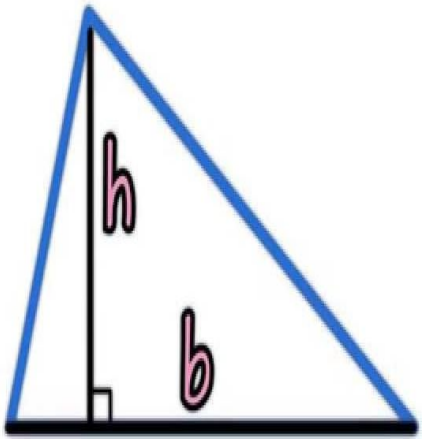
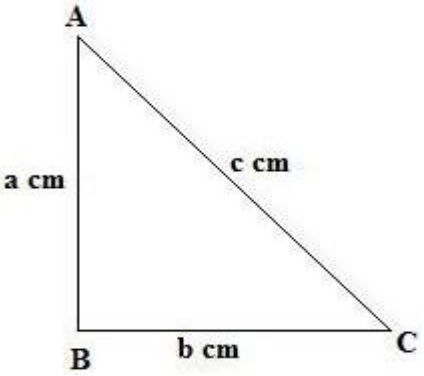
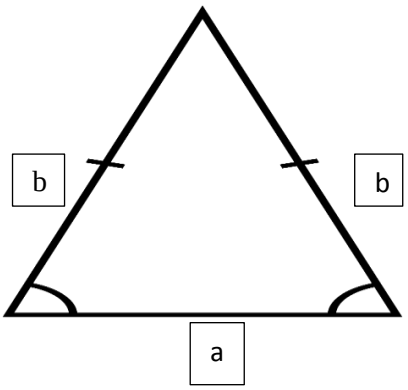
It deals with the measurement of sides, perimeters, areas of plane figures such as triangles, quadrilaterals, polygons, circles etc.

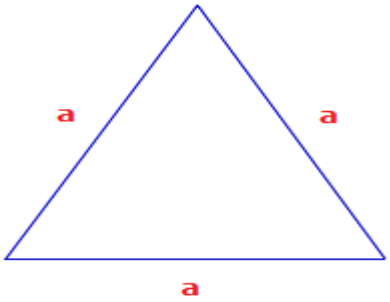
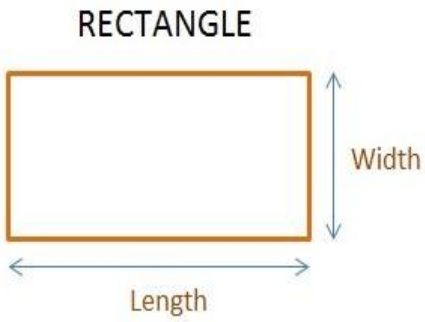
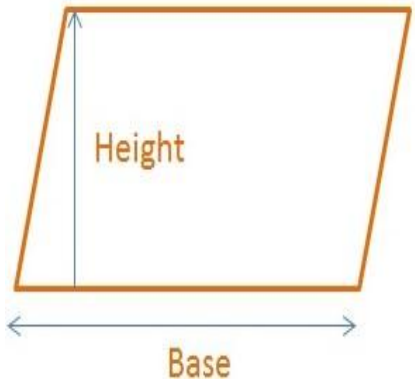
2) **Mensuration of Solid Figures:**

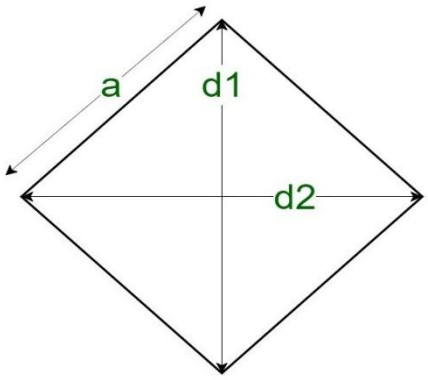
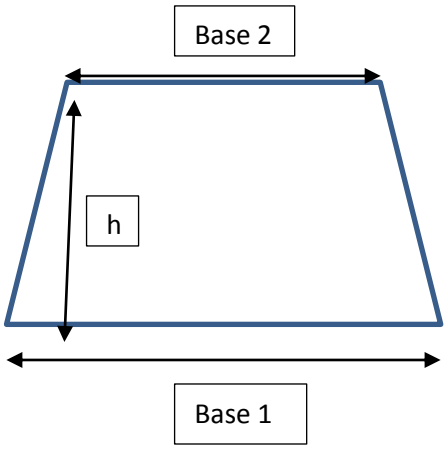
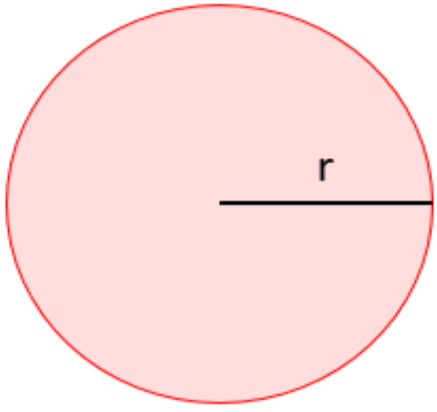
A figure bounded by one or more surfaces is said to a solid figure.

It deals with the measurement of areas of the surfaces and volumes of the solid figures such as cuboids, sphere, cone and cylinder.

1) **Mensuration of Plane Figures:**

Sr. No.	Shape	Area	Perimeter
1)	**Triangle** 	Area of triangle = $\frac{1}{2} XbaseXheight$ $= \frac{1}{2} XbXh$	Perimeter of triangle = Sum of all sides
2)	**Right Angle Triangle** 	Area of right-angle triangle = $\frac{1}{2} XaXb$	Perimeter of right-angle triangle = a + b + c
3)	**Isosceles Triangle** 	Area of isosceles triangle = $\frac{a}{4}\sqrt{4b^2 - a^2}$	Perimeter of isosceles triangle = a + 2b

4)	**Equilateral Triangle** 	Area of equilateral triangle = $\frac{\sqrt{3}}{4}a^2$	Perimeter of equilateral triangle = 3a
5)	**Rectangle** 	Area of rectangle = (length) x (width)	Perimeter of rectangle = 2(length + width)
6)	**Square** 	Area of square = $(side)^2$	Perimeter of square = 4 X Side
7)	**Parallelogram** 	Area of a parallelogram = Base x Height	Perimeter of parallelogram = 2 (b + h)

8)	**Rhombus** 	Area of rhombus = $\left(\frac{1}{2} X length\ of\ diagonal\ 1 \right.$ $\left. X length\ of\ diagonal\ 2\right)$ $=\left(\frac{1}{2} X d_1 X d_2\right)$	Perimeter of rhombus = 4 X a
9)	**Trapezoid** 	Area of trapezoid = $\frac{1}{2} X [base\ 1 + base\ 2]$ $x\ height$	Perimeter of trapezoid = sum of all sides
10)	**Circle** 	Area of circle = πr^2	Circumference of circle = $2\pi r$

Q.1) The area of rectangle with one side 8cm is $172 cm^2$. Find length of the other side. **(S.Q.P)**

Q.2) A square grassy plot is of 100 metre. It has a gravel path 10 metres wide all round it on the inside. Find the area of the path. **(S.Q.P., W-18, S-19)**

Q.3) Find the area of a rhombus whose diagonals are of lenghts 10cm and 8.2cm. **(W-17)**

Q.4) Find the area of rhombus whose diagonals are 6cm and 9cm. **(W-18)**

Q.5) The area of a rectangular courtyard is 3000sq. m. Its sides are in the ratio 6: 5. Find the perimeter of courtyard. **(W-17, S-19)**

Q.6) The length of one side of the rectangle is twice the length of its adjacent side. If the perimeter of rectangle is 60cms, find the area of the rectangle. **(S-18)**

Q.7) Find the area of ring between two concentric circles whose circumferences are 75cm and 55cm. **(S-19)**

Q.8) Find the area of a trapezium whose parallel sides are 10cm and 8cm, where the perpendicular between the sides is 4cm.

Q.9) The area of a parallelogram is 24 square centimeter and the base is 4 centimeters. Find the height.

Q.10) Find the area of a triangle whose sides are 50m, 78m, 112m respectively.

Q.11) The length and breadth of a rectangle are in the ratio 9:5. If its area is $720m^2$, find its perimeter.

Q.12) The perimeter of a rhombus is 146cm and one of its diagonals is 55cm. Find the other diagonal and the area of the rhombus.

Q.13) A 5100 sq.m trapezium has the perpendicular distance between the two parallel sides is 60m. If one of the parallel sides be 40m then find the length of the other parallel side.

Q.14) The radius of a wheel is 42cm. How many revolutions will it make in going 26.4km?

Q.15) The circumference of a circular garden is 1012m. Find the area of outsider road of 3.5m width runs around it. Calculate the area of this road and the cost of gravelling the road at Rs. 32 per 100 sqm.

Q.16) Find the area between two concentric circles whose radii are 4m and 2m.

Q.17) A perimeter of rhombus is 200 cm and of its diagonal is 60 cm. Find the other diagonal.

Q.18) The area of a right-angled triangle is 600 sq. cm and one of the sides containing right angle is 30cm. Find the hypotenuse.

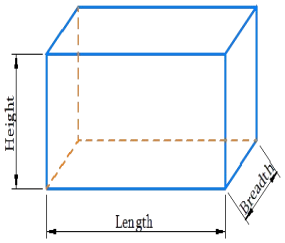
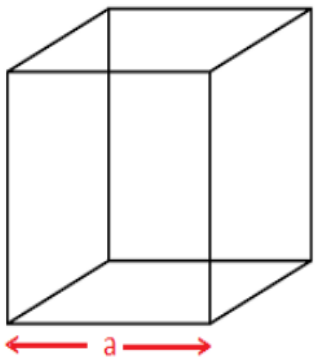
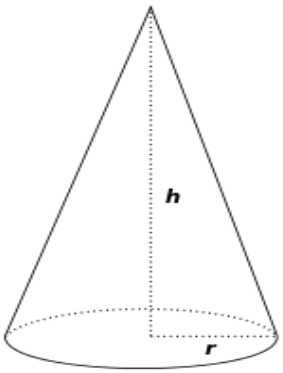
Q.19) A flooring tile has the shape of a parallelogram whose base is 24 cm and the

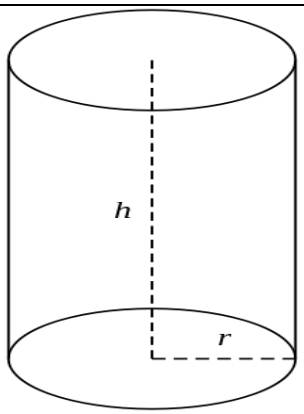
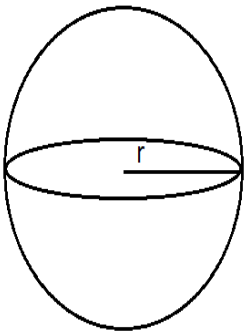
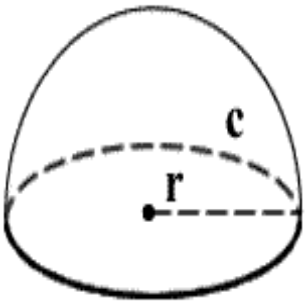
corresponding height is 10 cm. How many such tiles are required to cover a floor of area 1080m^2?

Q.20) The area of a field in trapezium shape is 480m^2. The distance between two parallel sides is 15m and one of the parallel sides is 20m. Find the other side.

Q.21) The floor of a hall consists of 3000 tiles which are rhombus shaped having diagonals 45 cm and 30 cm in length. Find the total cost of polishing the floor at the rate of Rs. 4 per square meter.

Q.22) The base of a triangular field is three times its corresponding height. If the cost of ploughing the field at the rate of Rs 15/m^2 is 20250. Find the base and the corresponding height of the field.

2)	**Mensuration of Solid Figures:**		
Sr. No.	**Shape**	**Volume (Cubic units)**	**Surface area**
1)	**Cuboid** 	Volume of Cuboid = $length\ X\ breadth\ X\ h$ $= l\ X\ b\ X\ h$	Surface Area = $2[lb + bh + lh]$
2)	**Cube** 	Volume of Cube = $(length\ of\ edge)^3$ $= a^3$	Surface Area = $6a^2$
3)	**Cone** 	Volume of Cone = $\frac{1}{3}\pi r^2 h$	i) Curved Surface Area of a Cone = πrl ii) Whole Surface Area of a Cone = $\pi r(l + r)$
4)	**Cylinder**	Volume of a Cylinder	i) Curved Surface Area of

		= area of base circle X height $= \pi r^2 h$	Cylinder = $2\pi rh$ ii) Total Surface Area of Cylinder = $2\pi r(r+h)$
5)	**Sphere** 	Volume of Sphere = $\frac{4}{3}\pi r^3$	Surface Area of Sphere = $4\pi r^2$
6)	**Semi sphere** 	Volume of Semi sphere = $\frac{2}{3}\pi r^3$	Surface Area of Semi sphere = $2\pi r^2$

Q.23) A cone has a circular base of radius 10cm and slant height 30cm. Calculate the surface area. **(S.Q.P)**

Q.24) If the volume of a sphere is $\frac{4\pi}{3}$ cm^3. Find its surface area. **(W-17)**

Q.25) The length, breadth and height of a cuboid are 8cm, 11cm and 15cm respectively. Find the total surface area. **(W-18)**

Q.26) The volume of cube is 1000cm^3. Find its total surface area. **(W-18)**

Q.27) Find the surface area of a cuboid of dimensions 26cms, 20cms and 12cms. **(S-18)**

Q.28) Find the capacity of a cylindrical water tank whose radius is 2.1m and length is 5m. **(S-18)**

Q.29) The volume of a sphere is $\frac{88}{21}$ cubic meters. Find its surface area. **(S-19)**

Q.30) Find the length of the longest pole that can be placed in a room 12m long, 9m broad and 8 m high. **(W-19)**

Q.31) Find the volume of the sphere whose surface area is 616 sq. m. **(W-19)**

Q.32) A cylinder has hemispherical ends having radius 14cm and height 50cm. Find the total surface area. **(W-19)**

Q.33) A solid right circular cone of radius 2m and height 27m is melted and recasted into a sphere. Find the volume and surface area of a sphere. **(W-19)**

Q.34) The internal measures of a cuboidal room are 12m X 8m X 4m. Find the total cost of whitewashing all four walls of a room, if the cost of whitewashing is Rs. 8 Per m^2 . What will be the cost of whitewashing if the ceiling of the room is also whitewashed? **(S.Q.P)**

Q.35) A circuis tent is cylindrial to a height of 3m and conical above it. If its diameter is 105m and slant height of cone is 5m, calculate the area of total canvas required. **(W-17)**

Q.36) External dimensions of a wooden cuboid are 30cm X 25cm X 20cm. If the thickness of wood is 2cm all round. Find the volume of the wood contained in the cuboid formed. **(S-18)**

Q.37) A metal strip having sides 17 X 7 X 5 is melted down and minted into coins each of diameter 1.4cm and thickness 0.08cm. Assuming no wastage, how many coins can be minted? **(S-19)**

Q.38) Circumference of the base of a cylinder is132cm and its height 25cm.Find the volume of the cylinder.

Q.39) Find the curved surface area and total surface area of a right circular cylinder whose height is 15 cm and the radius of the base is 7cm.

Q.40) Find the height of a cylinder whose radius is 7cm and the total surface area is 968 cm^2.

Q.41) The curved surface area of a cone is 4070 cm^2 and its diameter is 70cm. What is its slant height?

Q.42) If the length, breadth and height of a cuboid are 5cm, 3cm and 4cm. Find its total surface area and lateral surface area.

Q.43) If the length of the side of the cube is 6cm, then find its total surface area and lateral surface area.

Q.44) A cube of 1.7litres volume will have each edge closest to?

Q.45) The surface area of a cube is 486 cm^2 and melted into small cubes, each of 54mm^2 surface area. Find the number of small cubes.

Q.46) The length, breadth and depth of a pond are 20.5 m, 16 m and 8 m respectively. Find the capacity of the pond in litres.

Q.47) The dimensions of a brick are 24 cm × 12 cm × 8 cm. How many such bricks will be required to build a wall of 20 m length, 48 cm breadth and 6 m height?

Q.48) The volume of a container is 1440 m^3. The length and breadth of the container are 15 m and 8 m respectively. Find its height

Q.49) Find the volume of a cone, if radius is 4 cm and height is 9 cm.

Q.50) Find the volume of a cone which has the base radius of 8 cm and slant height (l) of 13 cm.

Q.51) Find the volume of a cone the radius of whose base is 21 cm and height is 28 cm.

Q.52) If the height of a cone is 15 cm and its volume is 770 cu.cm; find the radius of its base.

Q.53) A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

Q.54) Calculate the volume of a cylinder where: a) the area of the base is 30 cm^2 and the height is 6 cm. (b) the radius of the base is 14 cm and the height is 10 cm.

Q.55) A cylinder has a radius of 3 cm and a height of 10 cm. Find its total surface area and its volume.

Q.56) The radius of a cylinder is 7 cm, while its volume is 1.54 L. What is the height of the cylinder?

Q.57) A cylindrical container with no lid has inner radius 20 cm and depth 10 cm. It needs to be coated on the inner walls with a paint which costs INR 6000/m^2 of area. Find the cost of this paint job.

Q.58) If the lateral surface of the cylinder is 500 cm^2 and its height is 10 cm, then find the radius of its base.

Q.59) A rectangular block of metal has a dimension of 21 cm, 77cm and 24 cm. The block has been melted into a sphere. Find the radius of the sphere.

Q.60) The surface area of a solid sphere is 1254 square feet. Find the volume of the solid sphere.

Q.61) A lead bar 10cm X 5cm X 4cm is melted an made into 5 equal spherical bullets. Find the diameter and surface area of the bullet.

MCQ Question

(Total number of Question=Marks*3=10*3=30)

Note: Correct answer is marked with **bold.**

1. What is the area of a parallelogram that has a height of 7m and a base of 4 m

a) 11 sq.m
c) 14 sq.m
b) 28 sq.m
d) None of these

2. The area of a rhombus whose diagonals are of lengths 10 cm and 8.2 cm is

a) 41 sq.cm
c) 210 sq.cm
b) 82 sq.cm
d) 420 sq.cm

3. The area of a trapezium is 480cm^2, the distance between two parallel sides is 15 cm and one of the parallel sides is 20cm. the other parallel side is

a) 20 cm
c) 44 cm
b) 34 cm
d) 50 cm

4. The area of a rhombus is 240cm^2 and one of the diagonals is 16 cm. Find the another

a) 16 cm
c) 30 cm
b) 20 cm
d) 36 cm

5. If a cuboidal box has height, length and width as 20 cm, 15 cm and 10 cm respectively. Then its total surface area is

a) $1100cm^2$
c) $1300cm^2$
b) $1200cm^2$
d) $1400cm^2$

6. The height of a cylinder whose radius is 7 cm and the total surface area is $968cm^2$ is

a) 15 cm
b) 17 cm

c) 19 cm
d) 21 cm

7. The height of a cuboid whose volume is $275cm^3$ and base area is $25cm^2$ is
a) 10 cm
c) 12 cm
b) 11 cm
d) 13 cm

8. Find the cost of fencing a rectangular park of length 10m and breath 5m at the rate of Rs.10 per meter
a) Rs.300
c) Rs.150
b) Rs.600
d) Rs.1200

9. If the sides of a triangle are 16 cm, 30 cm and 34 cm, what is its area
a) 240 cm^2
c) 260 cm^2
b) 120 cm^2
d) 272 cm^2

10. The radius of a wheel is 22.4cm. What is the distance covered by the wheel making 500 revolutions
a) 252 m
c) 353 m
b) 704 m
d) 808 m

11. Find the length of the longest pole that can be placed in a room 12m long,8m broad and 9m high.
a) 16 m
c) 18 m
b) 17 m
d) 19 m

12. The area of a trapezium is
a) $\frac{1}{2}(sum\ of\ parallel\ sides)Xheight$
b) $2(sum\ of\ parallel\ sides)Xheight$
c) $(sum\ of\ parallel\ sides)Xheight$
d) $\frac{1}{2}(sum\ of\ parallel\ sides)+height$

13. The area of rhombus is
a) side X side
c) d_1+d_2
b) d_1Xd_2
d) $\frac{1}{2}Xd_1Xd_2$

14. The area of 4 walls of the room are
a) $2(lb+bh+hl)$
c) $2(lbXbhXhl)$
b) $2l(h+b)$
d) $2h(l+b)$

15. If the side of the cube is 2m, then the surface area of the cube is
a) 24 m^2
c) 4 m^2
b) 8 m^2
d) 12 m^2

16. 1 m^3 is
a) 10 L
c) 1000 L
b) 100 L
d) 10000 L

17. 1 ml =
a) 1 cm^3
c) 100 cm^3
b) 10 cm^3
d)1000 cm^3

18. A perimeter of rhombus is 200 cm and one of its diagonal is 60 cm. Find the other diagonal.

a) 260 cm
c) 80 cm
b) 140 cm
d) None of these

19. The length and breadth of a rectangle are in the ratio 3:2. If the area of the rectangle is 726 m^2, find its perimeter.

a) 110 m
c) 220 m
b) 55 m
d) None of these.

20. Length and breadth of a rectangular field are 25 m and 15 m respectively. Find the barbed wire required to fence the field.

a) 40 m
c) 160 m
b) 80 m
d) None of these

21. A cylindrical tank has a capacity of 5632 m^3. If the diameter of its base is 16 m, find its depth

a) 66 m
c) 26 m
b) 30 m
d) 28 m

22. What is the area of an equilateral triangle of side 16 cm?

a) $48\sqrt{3}cm^2$
c) $9.6\sqrt{3}cm^2$
b) $128\sqrt{3}cm^2$
d) $\boldsymbol{64\sqrt{3}cm^2}$

23. The cured surface area of a right circular cone of height 15 cm and base diameter 16 cm is

a) $60\pi cm^2$
c) $120\pi cm^2$
b) $68\pi cm^2$
d) $\boldsymbol{136\pi cm^2}$

24. The height of a right circular cone whose radius is 5 cm and slant height 13 cm will be

a) 12 cm
c) 13 cm
b) 10 cm
d) 5 cm

25. A solid sphere of radius x cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is

a) 3x cm
c) 4x cm
b) x cm
d) 2x cm

26. What is the volume of a sphere whose radius is 3 cm?

a) $24\pi cm^3$
d) $27\pi cm^3$
b) $\boldsymbol{36\pi cm^3}$
c) $30\pi cm^3$

27. What is the curved surface area of a cone of radius 3 cm and height 4 cm?

a) $14\pi cm^2$
c) $16\pi cm^2$
b) $\boldsymbol{15\pi cm^2}$
d) $17\pi cm^2$

28. The perimeter of a triangular field is 144 m and the ratio of the sides is 3:4:5. The area of the field is

a) 864 m^2
c) 468 m^2
b) 824 m^2
d) None of these

29. The area of an isosceles triangle having base x cm and one side y cm is

a) $\frac{x}{2}\sqrt{\frac{4y^2-x^2}{4}}\ cm^2$
c) Both
d) None of these
b) $\frac{x}{2}\sqrt{\frac{4x^2-y^2}{4}}\ cm^2$

30. One side of an equilateral triangle is 30 cm. Its area is

a) $225\sqrt{3}cm^2$
c) $225\sqrt{2}cm^2$
b) $112.5cm^2$
d) $225cm^2$

10. Statistics

Position in Question Paper **Total Marks-20**

Q.1. f) 2-Marks.
Q.1. g) 2-Marks.
Q.2. d) 4-Marks.
Q.6. a. i) 3-Marks.
Q.6. a. i) 3-Marks.
Q.6. b) 6-Marks.

Descriptive Question

Measures of Dispersion:

The measure of dispersion indicates the scattering of data. In other words, Dispersion is the extent to which values in distribution differ from the average of the distribution. It gives an idea about the extent to which individual items vary from one another and from the central value.

Measures of Dispersion are:

The Range (Absolute Measure)
The Mean Deviation from (i) Mean, (ii) Median (Absolute Measure)
The Standard Deviation (Absolute Measure)
The Variance (Relative Measure)

The Range: -

For Ungrouped Data:

The range is the difference between the highest and lowest values in the set of data

Let L = Largest value of the observation in the given set of data.
S = Smallest value of the observation in the given set of data.

Range = Largest Value – Smallest Value = L - S

For Grouped Data:

The range is the difference between the upper limit of highest class and the lower limit of the lowest class

$$\text{Range} = \{Upper\ limit\ of\ highest\ class\} - \{Lower\ limit\ of\ lowest\ class\}$$

Co-efficient of Range:

$$Coefficient\ of\ Range = \frac{Range}{Sum\ of\ the\ highest\ and\ the\ lowest\ values}$$

Q.1) Find the range and co-efficient of range of the data:
50, 90, 120, 40, 180, 200, 80 **(W-13, W-17)**

Q.2) Find the range and co-efficient of range of the data:
120, 50, 90, 100, 180, 200, 150, 40, 80 **(S-18)**

Q.3) Find the range of the data:
14, 18, 22, 35, 42, 44, 8, 7, 5 and 2 **(W-18)**

Q.4) Find the range and co-efficient of range
40, 52, 47, 28, 45, 36, 47, 50 **(S-12, S-19)**

Q.5) Find the range and co-efficient of range of the data:
3, 7, 11, 2, 16, 17, 22, 20, 19 **(W-19)**

Q.6) Find range and coefficient of range of the data:
3, 6, 10, 1, 15, 16, 21, 19, 18 **(S.Q.P, S-13)**

Q.7) Find the range of the data: **(W-14)**
2, 3, 1, 10, 6, 31, 17, 20, 24

Q.8) Find the range of the following data: **(S-16)**
800, 725, 750, 900, 925, 910, 1000, 790, 870, 920

Q.9) Calculate the range from the following data: **(W-15)**
Weight on Kg: 70, 75, 69, 80, 85, 83, 65, 89, 73, 84, 90

Q.10) Calculate the range and the co-efficient of range for the following data: **(W-17)**

Class	21-25	26-30	31-35	36-40	41-45
Frequency	4	16	38	12	10

Q.11) Calculate the range and coefficient of range from the following data: **(S-18, W-19)**

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of Students	6	10	16	14	8	4

Q.12) Find range and coefficient of range for the following data: **(S-19)**

C.I	10-19	20-29	30-39	40-49	50-59
F	15	25	13	17	10

Q.13) Calculate the range and coefficient of range from the following distribution:

Marks	0-10	10-20	20-30	30-40	40-50
No. of Student	8	12	10	15	5

The Mean Deviation:

It is the arithmetic mean of all the absolute deviations from any one its average.

Mean Deviation = $\frac{\sum|d_i|}{N}$

Where $|d_i| = |x_i - \overline{x}|$ where $\overline{x}$ = arithmetic mean

OR

$= |x_i - M|$ where M = Median

For Raw Data:

Mean Deviation about Mean = $\frac{\sum|x_i-\overline{x}|}{N}$

Where $\overline{x}$ = Mean of N observations.

$\overline{x} = \frac{x_1+x_2+x_3+\cdots+x_n}{Total\ no.of\ observations} = \frac{\sum x_i}{N}$

Mean Deviation about Median = $\frac{\sum|x_i-M|}{N}$

Where M = Median of N observations.

Let x be a variable with N number of observations and these observations are arranged in ascending order.

(i) If N = even number, then

$$\text{Median} = \frac{\left(\frac{N}{2}\right)^{th} place\ observation + \left(\frac{N}{2}+1\right)^{th} place\ observation}{2}$$

(ii) If N = odd number, then

$$\text{Median} = \left(\frac{N+1}{2}\right)^{th} place\ observation$$

Q.14) Calculate the Mean Deviation about the mean of the following data: 3, 6, 5, 7, 10, 12, 15, 18 **(S-18)**

Q.15) Calculate the Mean Deviation about the mean of the following: 12, 6, 7, 3, 15, 10, 18, 5

Q.16) Calculate the Mean Deviation about (i) Mean (ii) Median in respect of the marks obtained by nine students given below.
Marks (out 25): 7, 4, 10, 9, 15, 12, 7, 9, 7

Q.17) Calculate the Mean Deviation about the mean of the digits 1, 2, 3, 4, 5, 6, 7, 8, 9

For Discrete Frequency Distribution:

Mean Deviation about Mean = $\frac{\sum f_i|x_i-\bar{x}|}{\sum f_i} = \frac{\sum f_i|d_i|}{N}$

where $\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{\sum f_i x_i}{N}$

$N = \sum f_i$

Mean Deviation about Median = $\frac{\sum f_i|x_i-M|}{\sum f_i} = \frac{\sum f_i|d_i|}{N}$

Q.18) Calculate the Mean Deviation about (i) mean (ii)median of the following distribution **(S-15)**

x_i	3	4	5	6	7	8
f_i	4	9	10	8	6	3

Q.19) Calculate the Mean Deviation about mean for the following data. **(W-15)**

Marks	3	4	5	6	7	8
No. of Students	1	3	7	5	2	2

Q.20) Calculate the Mean Deviation about (i) mean (ii)median of the following data:

x_i	10	11	12	13	14
f_i	3	12	18	12	3

For Grouped Frequency Distribution:

Mean Deviation about Mean = $\frac{\sum f_i|x_i-\bar{x}|}{\sum f_i} = \frac{\sum f_i|d_i|}{N}$

where x_i = Mid-value or class mark.

$x_i = \frac{Upper\ boundary+Lower\ boundary}{2}$

where $\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{\sum f_i x_i}{N}$

$N = \sum f_i$

Mean Deviation about Median = $\frac{\sum f_i|x_i-M|}{\sum f_i} = \frac{\sum f_i|d_i|}{N}$

where M = Median of distribution

Median = M = $l_1 + \frac{\left(\frac{N}{2}-f_c\right)}{f_m} X\ c$

where l_1 = Lower boundary of median class.

f_c = Cumulative Frequency Less Than previous to median class.

f_m = Frequency of median class.

c = Class width.

N = Total Frequency.

Q.21) Find mean of the following data: **(W-18)**

Class – Interval	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	8	3	1

Q.22) Find mean for the following data: **(W-18)**

Class – Interval	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	6	10	18	9	3

Q.23) Find the mean deviation from (i) mean (ii) median of the following distribution: **(S-13, S-14, S-19)**

C.I	0-10	10-20	20-30	30-40	40-50
$\mathbf{f_i}$	5	8	15	16	6

Q.24)

Class Interval	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	6	10	18	9	3

Find the mean deviation from (i) mean (ii)median of the following: **(W-10)**

Q.25) Find mean deviation from (i) mean (ii)median. **(S-16, W-16)**

Weight (in gms)	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of Items	7	12	16	25	19	15	6

Q.26) Calculate the mean deviation about mean for the following data: **(W-14)**

Expenditure	40-59	60-79	80-99	100-119	120-139
No. of families	50	300	500	200	60

The Standard Deviation (S.D.):

The standard deviation is defined as the square root of the mean of the squares of the deviations from mean.

The Variance:

The square of standard deviation is called the variance

Co-efficient of S.D.:

The rate of change of S.D. with respect to mean is called co-efficient of S.D.

Co-efficient of S.D. = $\frac{\sigma}{Mean} = \frac{\sigma}{\overline{x}}$

Co-efficient of Variance:

Co-efficient of Variance = $\frac{\sigma}{\overline{x}} X100$, where $\overline{x} = Mean, \sigma = S.D.$

Note: - To compare the consistency (variability) of different groups, we compare their co-efficient of variance. A group of data having

higher co-efficient of variance is less consistent (or more variable) and a group of data having lower co-efficient of variance is more consistent (or less variable)

For Raw Data:

S.D. = $\sigma = \sqrt{\frac{\sum(x_i-\overline{x})^2}{N}} = \sqrt{\frac{\sum {d_i}^2}{N}}$ where $d_i = x_i - \overline{x}$ and $\overline{x} = \frac{\sum x_i}{N}$

Variance = $\frac{\sum(x_i-\overline{x})^2}{N} = \frac{\sum {d_i}^2}{N}$ where $d_i = x_i - \overline{x}\, and\ \overline{x} = \frac{\sum x_i}{N}$

Q.27) Compute the standard deviation and co-efficient of variance for 15, 22, 27, 11, 9, 21, 14, 9 **(W-17)**

Q.28) Compute standard deviation for the following data: 1, 2, 3, 4, 5, 6, 7 **(W-19)**

Q.29) Find the standard deviation for the following data: 49, 63, 46, 59, 65, 52, 60, 54

Q.30) Calculate S.D. and variance of the following data: 25, 50, 30, 70, 42, 36, 48, 34, 60

For Discrete Frequency Distribution:

S.D. = $\sigma = \sqrt{\frac{\sum f_i {x_i}^2}{N} - (\overline{x})^2}$

Variance = $\frac{\sum f_i {x_i}^2}{N} - (\overline{x})^2$

Q.31) Calculate S.D. from the following data:

Marks	5	15	25	35	45	55
No. of Students	10	20	30	50	40	30

For Grouped Frequency Distribution:

S.D. = $\sigma = \sqrt{\frac{\sum f_i {d_i}^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}\, Xc$

Variance = σ^2

Q.32) Find mean, standard deviation and coefficient of variance of the following: **(W-17, S-18, W-18)**

Class:	0-10	10-20	20-30	30-40	40-50
Frequency:	3	5	8	3	1

Q.33) Calculate standard deviation and coefficient of variance of the following table: **(S-19)**

Marks Below	5	10	15	20	25
No. of Students	6	16	28	38	46

Q.34) Find the mean, standard deviation and coefficient of variance of the following data: **(S-14, S-16, W-19)**

Class-Interval	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	15

Q.35) Calculate the standard deviation and variance for following distribution. **(S-13, W-13, S-17)**

Class Interval	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	3	5	9	15	20	16	10	2

Q.36) Calculate the standard deviation from the frequency table given below: **(W-16)**

Rainfall	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
No. of places	6	7	12	19	21	18	11	6

Q.37) Find the standard deviation for the following: **(W-15)**

C.I	0-20	20-40	40-60	60-80	80-100
$\mathbf{f_i}$	20	130	220	70	60

Q.38) Calculate the standard deviation and coefficient of variation from the following data: **(S-15)**

Wages in Rs.	55-65	65-75	75-85	85-95	95-105	105-115	115-125
No. of Workers	10	12	15	20	14	7	2

Q.39) If the coefficient of variation of certain data is 5 and mean is 60. Find the standard deviation. **(W-17)**

Q.40) If the coefficient of variation of a certain distribution is 75% and standard deviation is 24, find its mean. **(S-18)**

Q.41) If mean is 34.5 and standard deviation is 5, find the coefficient of variance. **(W-18)**

Q.42) The two sets of observations are given below:

Set-I	Set-II
$\overline{x} = 82.5$	$\overline{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

Which of two sets is more consistent? **(W-17, W-18, S-19, W-19)**

Q.43) If mean is 82 and standard deviation is 7, find the coefficient of variance. **(W-19)**

Q.44) The data of run scored by two batsman A & B in five one day matches is given below:

Batsman	**Average run scored**	**S.D.**
A	44	5.1
B	54	6.31

State which batsman is more consistent? **(S-18)**

Q.45) In two factories A and B, engaged in the same industry, in the area, the average weekly wages (in Rs.) and the S.D. are as follow:

Factory	**Average Wages**	**S.D.**
A	34.5	5.0
B	28.5	4.5

Which factory A or B is more consistent? **(S-16, W-16)**

Q.46) From the following data investigate which set is more consistent? **(S-17)**

Set	A.M = $\overline{x}$	S.D. = σ
Set-I	83.4	5.9
Set-II	51.85	7.45

Q.47) The runs scored by two batsman A & B in 5 one day matches are given below:**(S-12)**

A	48	50	39	46	37
B	50	52	60	55	53

Who is more consistent? Why?

Q.48) The scores of two batsmen A and B in ten innings during a certain season as under: **(W-14)**

A	32	28	47	63	71	39	10	60	96	14
B	19	31	48	53	67	90	10	62	40	80

Find which of two batsmen is more consisting in scoring

Q.49) An analysis of monthly wages paid to the workers in two firms A and B belonging to the same industry gives the following results:

	Firm-A	**Firm-B**
Average monthly Wages (in Rs.)	186	175
Variance of distribution of wages (in Rs.)	81	100

In which firm is there greater variability?

MCQ Question

(Total number of Question=Marks*3=20*3=60)

Note: Correct answer is marked with **bold.**

1. The total of all the observations divided by the number of observations is called
a) Variance
b) The mean
c) The range
d) The standard deviation

2. Find the mean of the numbers 5, 11, 2, 12, 4, 2
a) 4.1
b) 6
c) 4.5
d) 4

3. Find the median of the data 2, 8, 10, 12, 56, 9, 5, 2, 4
a) 8
b) 12
c) 10
d) 56

4. The maximum value in the class limit is called
a) Primary limit
b) Upper limit
c) Lower limit
d)Secondarylimit

5. A cumulative frequency table is also known as
a) Data **c)Less than C.F.Distribution**
b) Frequency distribution d) Frequency polygon

6. The average of lower and upper class limits is called
a) Class boundary **c) Class mark**
b) Class frequency d) Class limit

7. Find the range of the data 8, 10, 15, 25, 30, 40, 12, 20, 19
a) 24 **c) 32**
b) 22 d) 48

8. Find the median of the following set of points 15, 14, 10, 8, 12, 8, 16, 13
a) 12 c) 13
b) 12.5 d)15

9. The difference between the highest and lowest values in the set of data is called
a) range c) standard deviation
b) mean deviation d) variance

10. Co-efficient of range =?
a) $\frac{L+S}{L-S}$ **c)** $\frac{\boldsymbol{L-S}}{\boldsymbol{L+S}}$
b) $L-S$ d) $L+S$

11. Find range of distribution 160, 210, 208, 200, 290, 250
a) 130 c) 160
b) 290 d) None of these

12. Find the coefficient of range of the following data
59, 46, 30, 23, 27, 40, 52, 35, 29
a) 26 c) 0.84
b) 0.44 d)0.76

13. Find the range for the following distribution

Maximum temperature	25-26	27-28	29-30	31-32	33-34	35-36
No. of days	2	11	12	10	4	1

a) 13 c) 11
b) 10 **d) 12**

14. The arithmetic mean of all the absolute deviations from any one of its averages is called
a) range c) standard deviation
b) mean deviation d) variance

15. The difference between highest and lowest observation is 20 and coefficient of range is 0.077, then sum of highest and lowest value is
a) 210 **c) 260**
b) 220 d) 240

16. Find the mean deviation about the mean for the following data
5, 6, 7, 8, 6, 9, 13, 12, 15 is

a) 1.5 **c) 2.89**
b) 3.2 d) 5

17. Find the mean deviation about the mean for the following data

x_i	2	3	4	5	6	7	8
f_i	5	2	3	4	5	4	2

a) 2.3 c) 4
b) 3.4 **d) 1.66**

18. What is the standard deviation for the data given
5, 10, 7, 12, 0, 20, 15, 22, 8, 2

a) 6.89 **c) 7.26**
b) 10.1 d) 9

19. what is the variance of the data set? 86, 49, 63, 90, 82, 98, 36

a) 72 **c) 457.4**
b) 21.4 d) 395.7

20. The square root of the mean of the squares of the deviations from mean is called

a) range c) mean deviation
b) standard deviation d) variance

21. Standard deviation is denoted by

a) σ c) ρ
b) $\bar{x}$ d) η

22. The square of standard deviation is called

a) coefficient of S.D. **c) variance**
b) coefficient of variance d) None of these

23. Which of the following is not measures of dispersion?

a) range c) variance
b) standard deviation **d) median**

24. Calculate mean of the following distribution

Marks	3	4	5	6	7	8
No. of students	1	3	7	5	2	2

a) 5.5 c) 3.5
b) 6.5 d) None of these

25. Calculate mean of the following distribution

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	8	15	16	6

a) 25 c) 15
b) 27 d) None of these

26. If mean is 34.5 and standard deviation is 5. Find the coefficient of variance.

a) 14.49%
c) 75%
b) 5%
d) None of these

27. If the coefficient of variation of certain data is 5 and mean is 60. Find the standard deviation.
a) 9
c) 3
b) 5
d) 4

28. If co-efficient of variation of a distribution is 75% and standard deviation is 24. Find its mean.
a) 45
c) 30
b) 31
d)32

29. The ratio of standard deviation to mean is called
a) coefficient of S.D.
c) variation
b) coefficient of variation
d) None of these

30. Formula to calculate coefficient of variation is
a) $\frac{standard\ deviation}{mean}$
c) $(S.D.)^2$
b) $\frac{\boldsymbol{standard\ deviation}}{\boldsymbol{mean}}\boldsymbol{X100}$
d) $(S.D.X\ mean)$

31. Which one is the formula to calculate standard deviation for ungrouped data?
a) $\sqrt{\frac{\sum \boldsymbol{f_i d_i^2}}{\sum \boldsymbol{f_i}}}$
c) $\sqrt{\frac{\sum f_i d_i}{\sum f_i}}$
b) $\frac{\sum f_i {d_i}^2}{\sum f_i}$
d) None of these

32. Which one is the formula to calculate mean by step deviation method?
a) $\frac{\sum x_i}{N}$
c) $\boldsymbol{a + \left(\frac{\sum f_i u_i}{\sum f_i} Xc\right)}$
b) $\frac{\sum f_i x_i}{\sum f_i}$
d) None of these

33. Find the coefficient of variation of 24, 26, 33, 37, 29, 31
a) 42%
c) 14.4%
b) 11.9%
d)21.4%

34. The total marks scored by two students Snehal and Divya in 5 subjects are 460 and 480 with Standard deviation 4.6 and 2.4 respectively. Who is more consistent in performance?
a) Snehal
c) Both of them
b) Divya
d) None of these

35. The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.
a) 52%
c) 65%
b) 42%
d) 75%

36. The standard deviation and coefficient of variation of a data are 1.2 and 25.6 respectively. Find the value of mean.

a) 7.69 **c) 4.69**
b) 2.69 d) None of these

37. If the mean and coefficient of variation of a data are 15 and 48 respectively. Find the standard deviation.

a) 3.6 c) 2.6
b) 7.2 d) 6

38. The difference between highest and lowest observation is 20 and coefficient of range is 0.077 then the sum of highest and lowest value is

a) 210 **c) 260**
b) 220 d) 240

39. Compute the standard deviation for 15, 22, 27, 11, 9, 21, 14, 9

a) 6.22 c) 3.5
b) 4.25 d) None of these

40. Which one is the formula to calculate standard deviation for grouped frequency distribution

a) $\frac{\sum f_i d_i}{\sum f_i}$ b) $\frac{\sum f_i |d_i|}{\sum f_i}$
c) $\sqrt{\frac{\sum f_i |d_i|}{\sum f_i}}$ **d)** $\sqrt{\frac{\sum f_i d_i^2}{\sum f_i} - \left(\frac{\sum f_i d_i}{\sum f_i}\right)^2}$ **Xc**

41. The data of run scored by two batsman A & B in five one day matches is given below

Batsman	**Average run scored**	**S. D**
A	44	5.1
B	54	6.31

State which batsman is more consistent?

a) Batsman A c) Both of these
b) Batsman B d) None of these

42. In a grouped frequency distribution, the class intervals are 0-10, 10-20, 20-30, 30-40, then the class width is

a) 10 c) 20
b) 15 d) 30

43. Calculate standard deviation from the following data.

x_i	20	22	25	31	35	40	42	45
f_i	5	12	15	20	25	14	10	6

a) 7.3 c) 7.31
b) 7.32 **d) 7.35**

44. Calculate mean deviation about the mean of the following distribution

x_i	3	4	5	6	7	8
f_i	4	9	10	8	6	3

a) 1.195
b) 6.543
c) 4.65
d) None of these

45. The mean and variance of 5 items are 64 and 68 respectively. If two more of values 62 and 66 are added to the data, find the new variance of 7 items.

a) 86
b) 49.71
c) 25
d) None of these

46. Find the range and coefficient of range of the following data

C.I	10-19	20-29	30-39	40-49	50-59
F	15	25	13	17	10

a) Ran. = 50, C.O.R.= 0.725
b) Ran. = 50, C.O.R.= 0.65
c) Ran. = 60, C.O.R.= 0.725
d) Ran. = 65, C.O.R.= 0.725

47. Compute standard deviation of the data 19, 23, 16,7, 18, 35, 14, 24

a) 6.5
b) 7.93
c) 2.45
d) 8.22

48. Find the standard deviation of the following data

Class-Interval	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	25

a) 9.32
b) 4.76
c) 12.86
d) None of these

49. Calculate the mean deviation about the mean of the digits
1, 2, 3, 4, 5, 6, 7, 8, 9

a) 2.22
b) 4.25
c) 1.25
d) 3.5

50. Find standard deviation from the following data
15, 22, 27, 11, 9, 21, 14, 9

a) 4.89
b) 2.09
c) 6.36
d) None of these

51. The Arithmetic Mean of runs scored by two batsmen A and B in a series of 10 innings are 50 and 12 respectively. The standard deviations of their runs are 15 and 2 respectively. Who is most consistent?

a) Batsman A
b) Batsman B
c) Both of these
d) None of these

52. Which is the formula to calculate Mean Deviation about mean

a) $\frac{\sum x_i}{N}$

c) $\frac{\sum f_i|x_i-\bar{x}|}{\sum f_i}$

b) $\frac{\sum {d_i}^2}{N}$

d) None of these

53. Find the variance of the data. 0, 10, 20, 30, 40, 50

a) 291.67

c) 230

b) 290

d) 212

54. A batsman scores runs in 10 innings as 38, 70, 48, 34, 42, 55, 63, 46, 54 and 44. Then the mean score is

a) 4.94

c) 494

b) 49.4

d) 0.494

55. The following values are calculated in respect of marks of the students of Sections A and B of class X are

	Section A	**Section B**
Mean	85	92
Variance	81	64

The marks of which section have more variability?

a) Section B

b) Section A

c) Both sections are equal variable

d) Cannot be determined

56. The standard deviation of first 10 multiples of 4 is

a) 7

c) 11.5

b) 8

d) 14

57. The mean of a distribution is 14 and the standard deviation is 5. What is the value of the coefficient of variation?

a) 60.4%

c) 35.7%

b) 80.3%

d) 27.8%

58. If a series, coefficient of variation is 20% and arithmetic mean is 40, the value of standard deviation will be

a) 4

c) 8

b) 6

d) None of these

59. If arithmetic mean is 25 and standard deviation is 6.25, the coefficient of variation will be

a) 50%

c) 25%

b) 20%

d) 30%

60. The mean is denoted by

a) $\bar{x}$

c) η

b) σ

d) ϱ