XI MATHEMATICS

CHAPTER # 01 **SETS** **(Assignment #01)**

The human mind has never invented a labor-saving machine equal to algebra. —Author

Multiple Choice Questions:

1. If U = {1,2,3,4,5}, A={1,2}, B={1,2,3}, C={1,2,3,4} and D={1,2,3,4,5} then which is true?
   a. A ⊆ B ⊆ C b. U ∼ D c. B ⊆ C ⊆ D d. all of these
2. De-Morgan's law states:
   a. (A∩B)' = A'UB' b. A∩B' = B∩A' c. (AUB)'=A'∩B' d. both (a) and (c)
3. Let A={1,2,3} and B={3,4,5} the O(AUB) = _______.
   a. 2 b. 3 c. 4 d. 5
4. If (3, y) = (3,4) the y = _________.
   a. 2 b. 3 c. 4 d. none of these
5. Let S={1,2} and T={x, y} then which relation(s) is/are true?
   a. S=T b. S≠T c. T ∼ S d. both (b) and (c)
6. Let A={1,2} and B={3,4} then A×B = _______.
   a. {(4,1),(4,2),(5,2),(5,1)} b. {(2,4),(1,5)} c. {(1,4),(1,5),(2,4),(2,5)} d. none of these
7. A set is defined as __________.
   a. Some special list of elements b. well defined list of elements c. none of these d. both (a) and (b)
8. Let A={1,2,3} and B= Ø the AUB = _________.
   a. Ø b. {1} c. {1,2,3} d. none of these
9. If (x+3,3) = (-5,3) then the value of x is _______.
   a. 7 b. 2 c. -8 d. 5
10. If A={2,3} and B={1,2} the A—B = ________.
    a. {1,1} b. {0,3} c. {3} d. {2}
11. If A={0,1}, B={1,2} and C={2,3} then A×(B∩C) = __________.
    a. Ø b. {(1,3), (0,1)} c. {(0,2), (1,2)} d. {(2,3), (1,1)}
12. If a set has 4 elements then numbers of elements in its power set will be:
    a. 8 b. 16 c. 32 d. 4

Short Question:

Q.1 Write down all the subsets of {a, b, c, d} and find the power set of S={x, y, z}.

Q.2 If A=$\{x|x \in \mathbb{Z}, -1 < x < 5\}$, A=$\{y|y \in W, 1$ ≤y≤ $3\}$ and B=$\{z|z \in \mathbb{N}, 2 \leq 4\}$ then verify the De Morgan's Laws:
(i) (AUB)'=A'∩B' (ii) (A∩B)'=A'UB'

Q.3 If A={1,2,3}, B={4,5,6} and C={5,6,7} then prove that: (i) A×(BUC)=(A×B)U(A×C) (ii) A×(B∩C)=(A×B) ∩ (A×C)

CHAPTER # 02 REAL AND COMPLEX NUMBER SYSTEMS (Assignment #02)

Multiple Choice Questions:

1. $i^5 =$ _____
   a. i b. $-i$ c. 1 d. -1
2. The multiplicative inverse of (c,d) is ________.
   a. $\left(\frac{c}{d}, \frac{d}{c}\right)$ b. $\left(\frac{1}{c}, \frac{1}{d}\right)$ c. $\left(\frac{c}{c^2+d^2}, \frac{-d}{c^2+d^2}\right)$ d. $\left(\frac{1}{c^2}, \frac{1}{d^2}\right)$
3. The conjugate of a complex number (a,b) is:
   a. (a,b) b. (a,-b) c. (-a,-b) d. $\left(\frac{a}{b}, \frac{b}{a}\right)$
4. The real and imaginary parts of i(3-2i) are respectively :
   a. -2 and 3 b. 2 and -3 c. 2 and 3 d. 3 and -2
5. If $z = a + ib$ then $|z| =$ ______.
   a. $\sqrt{(a-b)}$ b. $\sqrt{a^2 - b^2}$ c. $\sqrt{a^2 + b^2}$ d. $\sqrt{a+b}$
6. Modulus of 3+3i is equal to _______.
   a. $3\sqrt{2}$ b. $\sqrt{15}$ c. $\sqrt{8}$ d. $\sqrt{6}$
7. The additive inverse of (c,d) is _______.
   a. (-c, -d) b. (-c,d) c. (c,-d) d. $\left(\frac{1}{c}, \frac{1}{d}\right)$
8. The conjugate of $z = -4 + 3i$ is ____________.
   a. $3 - 4i$ b. $4 - 3i$ c. $-3 - 4i$ d. none of these
9. $(5 + i)(5 - i) =$ ___________
   a. $3 - 4i$ b. $4 - 3i$ c. $-3 - 4i$ d. none of these
10. The ordered pairs (2,3) and (3,2) are
    a. Equal b. not equat c. emply d. none of these
11. $z + \overline{z}$ is equal to _________.
    a. Purely imaginary b. purely real c. complex d. none of these
12. $z - \overline{z}$ is equal to _________.
    a. Purely imaginary b. purely real c. complex d. none of these
13. $\overline{z_1 + z_2}$ Is equal to _______.
    a. $\overline{z_1} + z_2$ b. $z_1 + \overline{z_2}$ c. $\overline{z_1} + \overline{z_2}$ d. $z_1 + z_2$
14. $\overline{z_1 . z_2}$ Is equal to _______.
    a. $\overline{z_1} . z_2$ b. $z_1 . \overline{z_2}$ c. $\overline{z_1} . \overline{z_2}$ d. $z_1 . z_2$
15. $|z_1 + z_2|$ is equal to _________.
    a. $|z_1| . |z_2|$ b. $|z_1| . z_2$ c. $z_1 . |z_2|$ d. none of these
16. Factors of x^2+y^2 are __________.
    a. (x+y)(x-y) b. (x+y)(x+y) c. (x-y)(x-y) d. $(x + iy)(x - iy)$
17. $i^3 =$_______.
    a. 1 b. -1 c. i d. $-i$
18. $i^4 =$_______.
    a. 1 b. -1 c. i d. $-i$
19. (a,b).(c,d) = ___________.
    a. (ac-bd, ad+bc) b. (ac, bd) c. (ac+bd, ad-bc) d. (ad, bc)
20. In set of Complex number _________ is undefined.
    a. Equality b. inequality c. both (a) and (b) d. none of these

Short Question:

Q.1 Solve the following complex equations:
(i) (x,y).(2,3) = (-4,7) (ii) $(x + 3i)^2 = 2yi$ (iii) $(x + 2yi)^2 = xi$

Q.2 Find the additive inverse and multiplicative inverse of: (i) (-3,5) (ii) $2 + 3i$ (iii) $\frac{\sqrt{3}+i}{\sqrt{3}-i}$

Q.3 If $z_1 = 1 + i$ and $z_2 = 3 + 2i$, then find the value of: (i) $|5z_1 - 4z_2|$ (ii) $(\overline{z_1})^2$ (iii) $z_1 \div z_2$

Q.4 Factorize in the set of complex number: (i) $4a^2+9b^2$ (ii) $3m^2 + 8t^2$

Q.5 Verify that: $\frac{1+3i}{3-5i} + \frac{2}{5} = -\frac{4}{17} + \frac{7}{17}i$

Q.6 If $z_1 = a + bi$ and $z_2 = c + di$ the verify that: $|z_1 . z_2| = |z_1| . |z_2|$

Q.7 Find the real and imaginary parts of: (i) $\frac{3a+2bi}{a-bi}$ (ii) $\frac{\sqrt{3}+i}{\sqrt{3}-i}$

CHAPTER # 03 **<u>EQUATIONS</u>** **(Assignment # 03)**

<u>Multiple Choice Questions:</u>

1. If 2^{2x+3} = 32 then $x =$ _____.
   a. 2 b. 3 c. 4 d. 1
2. If ω is a complex cube root of unity, then $\omega^{16} =$_________.
   a. 0 b. 1 c. ω d. ω^2
3. If ω is a complex cube root of unity, then $\omega^{64} =$_________.
   a. 0 b. 1 c. ω d. ω^2
4. If ω is a complex cube root of unity, then $\omega^{32} =$_________.
   a. 0 b. 1 c. ω d. ω^2
5. If ω is a complex cube root of unity, then $1 - \omega - \omega^2 =$_________.
   a. 0 b. 1 c. ω d. none of these
6. If ω is a complex cube root of unity, then $\omega^{-32} + \omega^{-37}$ =_________.
   a. -1 b. 0 c. 1 d. none of these
7. If the roots of the equation $ax^2 + bx + c = 0$ are real then b^2-4ac = _______.
   a. Greater than zero b. less than zero c. equal to zero d. equal to one
8. If the roots of the equation $ax^2 + bx + c = 0$ are real and distinct then b^2-4ac = _______.
   a. Greater than zero b. less than zero c. equal to zero d. none of these
9. If -4 and 8 are the roots of quadratic equation then the equation is ________.
   a. $x^2 - 4x - 32 = 0$ b. $x^2 + 4x - 32 = 0$ c. $x^2 - 4x + 32 = 0$ d. $x^2 + 4x + 32 = 0$
10. The sum of the roots of $12x^2 - 16x + 4 = 0$ is _________.
    a. $-\frac{4}{3}$ b. $\frac{1}{3}$ c. $\frac{4}{3}$ d. $-\frac{5}{2}$
11. The product of the roots of $3x^2 - 5x + 2 = 0$ is _________.
    a. $\frac{3}{5}$ b. $\frac{2}{5}$ c. $\frac{3}{2}$ d. $-\frac{5}{3}$
12. For the equation $x^2 + qx + r = 0$, the sum of the roots is _______.
    a. $-\frac{q}{p}$ b. $\frac{q}{p}$ c. $\frac{p}{q}$ d. $-\frac{p}{q}$
13. If the roots of the equation $ax^2 + bx + c = 0$ are real and unequal then b^2-4ac = _______.
    a. Greater than zero b. less than zero c. equal to zero d. equal to one
14. For the equation $x^2 + mx + n = 0$, the product of the roots is _______.
    a. $l + m$ b. $\frac{m}{l}$ c. $\frac{n}{l}$ d. $-\frac{m}{l}$
15. If $x^4 - 3x^3 + 2x^2 + 2x + 1$ is divided by (x-1), the remainder is _________.
    a. 5 b. 4 c. 2 d. 1
16. If $x^3 + 3x^2 + 2x + 1$ is divided by (x+1), the quotient is _________.
    a. $x^2 - 1$ b. $x^2 + 2x + 2$ c. $x^2 - 2x - 2$ d. $x^2 + 2x$
17. If the roots of the equation $3kx^2 + 2x + 1 = 0$ are equal, then k = _______.
    a. $\frac{2}{3}$ b. $\frac{4}{3}$ c. $-\frac{1}{4}$ d. $\frac{1}{3}$
18. If α and β are the roots of $6x^2 + 5x + 1 = 0$ then $(\alpha - \beta)^2 =$ ________.
    a. $\frac{1}{36}$ b. $\frac{1}{4}$ c. $\frac{8}{9}$ d. $\frac{2}{7}$
19. The equation whose roots are α *and* $\beta$are written as _______.
    a. $Sx^2 - x + P$=0 b. $x^2 - Sx + P$=0 c. $x^2 + Sx - P$=0 d. $Px^2 - Sx + 1$=0
20. The value of (7+ω)(7+ω^2) is __________.
    a. 49 b. 47 c. 45 d. 40
21. If one of the roots of the equation $2x^2 - 7x + 3k = 0$ is zero then k = _______.
    a. 0 b. -7 c. 2 d. none of these

<u>Short Question:</u>

Q.1 Find the value of k, by synthetic division method so that:
(i) $(x - i)$ is a factor of $2kx^4+7x^3+kx^2+7x-1$ (ii) $(x + 5)$ is a factor of $2x^3+kx^2-2x-15$
(iii) $(x - 2)$ is a factor of $x^3 - 4x^2+kx-2$ (iv) $(x + 5)$ is a factor of $2x^3+9x^2-kx+15$
(v) $(x - 2)$ is a factor of x^3-kx^2+5x-2

Q.2 Find all the cube roots of: (i) 1 (ii) 8 (iii) -27 (iv) 125

Q.3 Show that: (i) $1 + \omega + \omega^2 = 0$ (ii) $\omega^3 = 1$ (iii) $\omega^{49} + \omega^{101} + \omega^{150} = 0$ (iv) $\omega^{155} + \omega^{247} + i^{360} = 0$ (v) $(1 - \omega - \omega^2)^5 = 32$

Q.4 Show that: $(1 + \omega)(1 + \omega^2)(1 + \omega^4)$ . . . to 2m factors = 1, where m=1 and m=2

Q.5 Solve the equations: (i) $x^4+3x^3+4x^2+3x+1=0$ (ii) $(2x^2-4x+4)^2-12(2x^2-2x)-40=0$

(iii) $(x-\frac{1}{x})^2+3(x+\frac{1}{x})=0$ (iv) $\sqrt{\frac{1-x}{x}}+\sqrt{\frac{x}{1-x}}=\frac{13}{6}$ (v) $\sqrt{2x+7}+\sqrt{x+3}=1$ (vi) $\frac{x-3}{x+3}+\frac{x+3}{x-3}=2\frac{4}{15}$

(vii) $x^6-26x^3-27=0$ (viii) $(x+6)(x+1)(x-2)(x+3)+56=0$ (ix) $(x-9)(x-7)(x+3)(x+1)=384$

(x) $(2x+5)^4+(2x+1)^4=82$

Q.6 For what value of k will the following equations make the roots equal:

(i) $k^3x^2+2(2k^2-1)x+4k=0$ (ii) $x^2+(7+k)x+(7k+1)=0$ (iii) $x^2-2x(1+3k)+7(3+2k)=0$ (iv) $(k+1)x^2+2(k+3)x+(2k+3)=0$

Q.7 For what value of 'a' and 'b' will both the roots of the equation $x^2+(2a-4)x=4b+15$, vanish?

Q.8 Find an equation whose roots are: (i) $(-1+i)$ & $(-1-i)$ (ii) ω and ω^2

Q.9 Find the condition that one root of $px^2+qx+r=0$ may be (i) double the other (ii) square of the other

Detailed Answer Questions:

Q.10 If α,β are the roots of $px^2+qx+r=0$, form an equation whose roots are: (i) $\frac{\alpha+1}{\beta}$ and $\frac{\beta+1}{\beta}$ (ii) α^2 and β^2

(iii) $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$ (iv) $(\alpha^2+\beta^2)$ and $\left(\frac{1}{\alpha^2}+\frac{1}{\beta^2}\right)$

Q.11 If α,β are the roots of $px^2-qx-r=0$, form an equation whose roots are:

(i) $\frac{-1}{\alpha^3}$ and $\frac{-1}{\beta^3}$ (ii) α^3 and β^3 (iii) $\left(2\alpha+\frac{1}{\beta}\right)$ and $\left(2\beta+\frac{1}{\alpha}\right)$ (iv) $\left(2\alpha+\frac{1}{\alpha}\right)$ and $\left(2\beta+\frac{1}{\beta}\right)$

Q.12 If α,β are the roots of $x^2-3x+2=0$, form an equation whose roots are:

(i) $(\alpha+\beta)^2$ and $(\alpha-\beta)^2$ (ii) $(1+\alpha+\alpha^2)$ and $(1+\beta+\beta^2)$ (iii) $(\alpha+2)$ and $(\beta+2)$ (iv) α^3 and β^3

(v) $\left(\alpha+\frac{1}{\alpha}\right)$ and $\left(\beta+\frac{1}{\beta}\right)$

Q.13 Solve these equations: (i) $x^2+y^2=169$, $x-y=13$ (ii) $x-y=5$, $x^2+2xy+y^2=9$ (iii) $2x+3y=7$, $2x^2-3y^2=-25$

(iv) $x+y=5$, $\frac{3}{x}+\frac{2}{y}=2$ (v) $2x^2+y^2=13$, $5x^2-2y^2+8=0$ (vi) $12x^2-25xy+12y^2=0$, $x^2+y^2=25$

(vii) $xy+15=0$, $x^2+y^2=34$ (viii) $2x^2+xy+y^2=8$, $6xy+2y^2=20$ (ix) $(x-1)^2+(y+3)^2=25$, $x^2+(y+1)^2=10$

(x) $x^2+y^2=5$, $xy=5$ (xi) $xy+6=0$, $x^2+y^2=13$ (xii) $4x+3y=25$, $\frac{4}{x}+\frac{3}{y}=2$ (xiii) $x+y=6$, $\frac{3}{x}+\frac{2}{y}=2$

Q.14 Find k, if one root of $4x^2-7kx+k+4=0$ is zero.

Q.15 Prove that the roots of $x^2-2x(m+\frac{1}{m})+3=0$ are real.

Q.16 Show that the roots of $abc^2x^2+c(3a^2+b^2)x+(3a^2-ab+b^2)=0$ are rational.

Q.17 Find the equation whose roots are the reciprocal of the roots of $x^2-6x+8=0$.

CHAPTER # 04   <u>MATRICES AND DETERMINANTS</u>   (Assignment #04)

<u>Multiple Choice Questions:</u>

1. The order of the matrix A = [5 6 7] is:
   a. 3×3   b. 1×1   c. 1×3   d. 3×1
2. The order of the matrix $B=\begin{bmatrix}4\\5\\6\end{bmatrix}$ is
   a. 3×3   b. 1×1   c. 1×3   d. 3×1
3. Let $P=\begin{bmatrix}1\\0\\2\end{bmatrix}$ and $=[2\quad 3]$, then PQ = _______.
   a. $\begin{bmatrix}4&2\\1&9\\6&7\end{bmatrix}$ b. $\begin{bmatrix}2&4\\4&1\\1&6\end{bmatrix}$ c. not possible   d. none of these
4. If $A=\begin{bmatrix}4&2\\1&9\\6&7\end{bmatrix}$, then A^2 = _________.
   a. Possible   b. not possible   c. $\begin{bmatrix}1&4\\9&16\\0&25\end{bmatrix}$ d. none of these
5. Let $A=\begin{bmatrix}-3&4&5\\4&9&1\\2&2&9\end{bmatrix}$ then A^t = _______.
   a. $\begin{bmatrix}-3&4&2\\4&9&2\\5&1&9\end{bmatrix}$ b. $\begin{bmatrix}-3&4&5\\4&9&1\\2&2&9\end{bmatrix}$ c. $\begin{bmatrix}-3&4&2\\4&9&1\\5&2&9\end{bmatrix}$ d. none of these
6. The Matrix $\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}$ is a ___________ matrix.
   a. Diagonal   b. Scalar   c. Unit   d. Null
7. The Matrix $\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ is a ___________ matrix.
   a. Diagonal   b. Scalar   c. Unit   d. Null
8. The Matrix $\begin{bmatrix}\sqrt{3}&0&0\\0&\sqrt{3}&0\\0&0&\sqrt{3}\end{bmatrix}$ is a _________ matrix.
   a. Diagonal   b. Scalar   c. Unit   d. Null
9. The Matrix $\begin{bmatrix}\sqrt{3}&0&0\\0&\sqrt{5}&0\\0&0&\sqrt{7}\end{bmatrix}$ is a _________ matrix.
   a. Diagonal   b. Scalar   c. Unit   d. Null
10. If the order of two matrices A and B are m×n and n×p respectively, then the order of AB is ______.
    a. m×p   b. p×n   c. n×p   d. p×m
11. A square matrix A is said to be Singular if
    a. $|A|=0$ b. $|A|=1$ c. $A=0$ d. none of these
12. $A=\begin{bmatrix}\lambda&3\\2&4\end{bmatrix}$ is a singular matrix, then the value of λ is :
    a. $\frac{2}{3}$ b. $\frac{4}{3}$ c. $\frac{3}{2}$ d. $-\frac{3}{2}$
13. If $\begin{bmatrix}2\lambda&3\\4&2\end{bmatrix}$ is a singular matrix, then the value of λ is :
    a. 3   b. $\frac{1}{2}$ c.2   d. 4
14. If A is a non-singular matrix then A^{-1} = _______.
    a. $\frac{Adj\ A}{A}$ b. $\frac{Adj\ A}{|A|}$ c. $\frac{|Adj\ A|}{|A|}$ d. Adj A. |A|
15. If the matrix $\begin{bmatrix}1&2\\3&\lambda\end{bmatrix}$ is a singular matrix, then the value of λ is :.
    a. $\frac{1}{6}$ b. 6   c. -6 d. 5
16. $|I_3|$ equal to .
    a. 1   b. 0   c. -1   d. 3
17. A square matrix A is said to be singular if :.
    a. A=0   b. $|A|=0$ c. $|A|=1$ d. A=1
18. If A,B,C are three matrices then $(ABC)^t$ = ________.
    a. $A^tB^tC^t$ b. $C^tB^tA^t$ c. $A^tC^tB^t$ d. A^tBC
19. If A,B,C are three matrices then $(ABC)^{-1}$ = ________.

a. $A^{-1}B^{-1}C^{-1}$ b. $C^{-1}B^{-1}A^{-1}$ c. $(AB)^{-1}C^{-1}$ d. $A^{-1}(BC)^{-1}$

20. If $A=\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ then $|A|=$ _________.

a. 14 b. -4 c. 4 d. 10

Short-Answer Questions:

Q.1 Define: (i) Transpose of a matrix (ii) Diagonal Matrix (iii) Scalar Matrix (iv) Unit Matrix (v) Null Matrix (vi) Singular Matrix

Q.2 Let $A=\begin{bmatrix}4&-2&0\\5&6&-7\\-3&1&9\end{bmatrix}$ and $C=\begin{bmatrix}2&3\\-4&0\\-1&3\end{bmatrix}$, find (i) AC (ii) C^tA^t

Q.3 Let $A=\begin{bmatrix}1&-1&2\\2&1&0\end{bmatrix}$ and X= $\begin{bmatrix}2&1\\0&2\\1&-1\end{bmatrix}$, then verify that: $(AX)^t=X^tA^t$

Q.4 Find the matrix 'X' so that: (i) $\begin{bmatrix}2&-3\\0&1\end{bmatrix}.X=\begin{bmatrix}-2&5\\8&-7\end{bmatrix}$ (ii) $X.\begin{bmatrix}1&3\\-2&4\end{bmatrix}=\begin{bmatrix}1&0\\0&1\end{bmatrix}$

Q.5 Solve for 'x': $\begin{bmatrix}-2&3\\4&-1\end{bmatrix}\begin{bmatrix}1&x&5\\2&4&x\end{bmatrix}\begin{bmatrix}-3\\1\\0\end{bmatrix}=\begin{bmatrix}2&-14\end{bmatrix}^t$

Q.6 Find x,y,z and v so that: $\begin{bmatrix}4&x+y\\z+v&3\end{bmatrix}=3\begin{bmatrix}x&y\\z&v\end{bmatrix}+\begin{bmatrix}x&6\\-1&2v\end{bmatrix}$

Q.7 Perform the matrix multiplication: $\begin{bmatrix}a&b&c\end{bmatrix}\begin{bmatrix}x&f&g\\f&y&h\\g&h&z\end{bmatrix}\begin{bmatrix}a\\b\\c\end{bmatrix}$

Q.8 Find a matrix 'B', if A-2B = 3X where $A=\begin{bmatrix}-2&1&0\\-1&4&3\\0&8&5\end{bmatrix}$ and $X=\begin{bmatrix}2&1&-1\\-3&2&-4\\5&4&0\end{bmatrix}$

Q.9 Prove the identity: $\left\{\begin{bmatrix}1&\omega&\omega^2\\\omega&\omega^2&1\\\omega^2&1&\omega\end{bmatrix}+\begin{bmatrix}\omega&\omega^2&1\\\omega^2&1&\omega\\\omega&\omega^2&1\end{bmatrix}\right\}\begin{bmatrix}1\\\omega\\\omega^2\end{bmatrix}=\begin{bmatrix}0\\0\\0\end{bmatrix}$

Q.10 Using the properties of determinants, prove that:

(i) $\begin{vmatrix}1&x&x^2\\1&y&y^2\\1&z&z^2\end{vmatrix}=(x-y)(y-z)(z-x)$ (ii) $\begin{vmatrix}1&x&yz\\1&y&zx\\1&z&xy\end{vmatrix}=(x-y)(y-z)(z-x)$

(iii) $\begin{vmatrix}1&1&1\\\alpha&\beta&\gamma\\\alpha^2&\beta^2&\gamma^2\end{vmatrix}=(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$ (iv) $\begin{vmatrix}1&1&1\\\alpha&\beta&\gamma\\\beta\gamma&\gamma\alpha&\alpha\beta\end{vmatrix}=(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

(v) $\begin{vmatrix}1&1&1\\a&b&c\\a^2&b^2&c^2\end{vmatrix}=(a-b)(b-c)(c-a)$ (vi) $\begin{vmatrix}1&1&1\\a&b&c\\a^3&b^3&c^3\end{vmatrix}=(a-b)(b-c)(c-a)(a+b+c)$

(vii) $\begin{vmatrix}1&1&1\\\alpha&\beta&\gamma\\\alpha^3&\beta^3&\gamma^3\end{vmatrix}=(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$ (viii) $\begin{vmatrix}x+y+2z&z&z\\x&y+z+2x&x\\y&y&z+x+2y\end{vmatrix}=2(x+y+z)^2$

(ix) $\begin{vmatrix}2l+m+n&m&n\\l&l+2m+n&n\\l&m&l+m+2n\end{vmatrix}=2(l+m+n)^2$ (x) $\begin{vmatrix}a+1&a+3&a+5\\a+4&a+6&a+8\\a+7&a+9&a+11\end{vmatrix}=0$

(xii) $\begin{vmatrix}a+x&a&a\\a&a+x&a\\a&a&a+x\end{vmatrix}=x^2(3a+x)$

Q.11 Solve for x using properties of determinants:

(i) $\begin{vmatrix}1&a&b\\1&x&b\\1&c&x\end{vmatrix}=0$ (ii) $\begin{vmatrix}x&1&0\\1&x&2\\0&2&x\end{vmatrix}=0$

Detailed-Answer Questions:

Q.12 Verify that: (i) $A.(Adj\ A)=|A|I_3$ (ii) $|Adj\ A|=|A|^2$ when $A=\begin{bmatrix}1&3&5\\2&4&7\\9&8&6\end{bmatrix}$

Q.13 Find the A^{-1} by Adjoint method for:

(i) $A=\begin{bmatrix}2&2&3\\1&-1&0\\-1&2&1\end{bmatrix}$ (ii) $A=\begin{bmatrix}1&2&1\\2&-1&1\\1&1&-1\end{bmatrix}$ (iii) $A=\begin{bmatrix}0&1&1\\1&3&0\\2&1&-1\end{bmatrix}$ (iv) $A=\begin{bmatrix}1&2&3\\4&6&8\\-1&2&-3\end{bmatrix}$

Q.14 Solve the following equations by Cramer's rule:

(i) $2x+y+z=1$, $x-2y-3z=1$ (ii) $x+2y+z=8$, $2x-y+z=3$ (iii) $x+y=5$, $y+z=7$ (iv) $x+y-z=2$, $x+2y+z=7$

$x+2y+4z=5$ $\quad$ $x+y-z\ \ =0$ $\quad$ $z+x=6$ $\quad$ $3x-y+2z=12$

Q.15 Solve the following equations by Adjoint method (Matrix method):

(i) $x+y+z\ \ =2$ $\quad$ (ii) $2x-y+2z\ \ =4$ $\quad$ (iii) $9x+7y+3t\ \ =6$ $\quad$ (iv) $x+y\ =5$

$2x-y-z=1$ $\quad$ $x+10y-3z=10$ $\quad$ $5x-y+4y=1$ $\quad$ $y+z=7$

$x-2y-3z=-3$ $\quad$ $x-y-z=6$ $\quad$ $6x+8y+2t=4$ $\quad$ $z+x=6$

CHAPTER # 05 <u>GROUPS</u> (Assignment #05)

Multiple Choice Questions:

1. If a,b ϵ S and $\star$ is a binary operation then a$\star$b ϵ _________.
   a. $\mathbb{N}$ b. $\mathbb{R}$ c. $\mathbb{Q}$ d. S
2. Addition is a binary operation on set S if a+b ϵ _________.
   a. $\mathbb{N}$ b. $\mathbb{R}$ c. $\mathbb{Q}$ d. S
3. A set can have at most _________ identity element w.r.t a binary operation.
   a. 1 b. 2 c. 3 d. none of these
4. Let S be a set with a binary operation $\star$, an element e ϵ S is said to be identity element of S with respect to $\star$ if $g\star e=e\star g=$ __________, $\forall g \epsilon$S
   a. 1 b. 0 c. g d. none of these
5. A groupoid (S,$\star$) is called a _________ is $\star$ is associative is S.
   a. Semi group b. Associative group c. Null group d. both (a) and (b)
6. A group (g, $\star$) is said to be finite of G consist of a finite number of elements, otherwise (G, $\star$) is said to be a/an __________ group.
   a. Empty b. non empty c. infinite d. global
7. Every elements of a group G is its own inverse the G is ___________.
   a. abelian b. commutative c. both (a) and (b) d. none of these
8. If G={1, ω, ω^2} the G is a __________.
   a. group b. Abelian Group c. both (a) and (b) d. none of these
9. The identity element is defined binary operation a$\star$b = 4a.b, $\forall$a,b ϵ $\mathbb{Q}$ **is ___________**.
   a. 1 b. $\frac{1}{2}$ c. $\frac{1}{4}$ d. $\frac{1}{12}$
10. The identity element in $\mathbb{R}$ with respect to $\star$ where a$\star$b = $\sqrt{a^2+b^2}$, $\forall$a,b ϵ $\mathbb{R}$ **is ___________**.
    a. 0 b. -1 c. 1 d. none of these

<u>Short-Answer Questions:</u>

Q.1 Show that multiplication is a binary operation on S={1, -1} but not on T={1,2}.

Q.2 Let S={A,B,C,D}, where A={a}, B={a,b}, C={a,b,c} and D= Ø, construct a multiplication table to show that ∪ and ∩ are binary operation on S.

Q.3 Show that multiplication is a binary operation on S={1, -1, i, $-i$}, where $i=\sqrt{-1}$. Is multiplication commutative and associative is S?

Q.4 A binary operation $\star$ in $\mathbb{Q}$ is defined by a$\star$b = 4a.b, $\forall$a,b ϵ $\mathbb{Q}$. Where "." Represents ordinary multiplication. Show that: (i) $\star$ is commutative (ii) $\star$ is associative (iii) $\frac{1}{4}$ is the identity element w.r.t. $\star$ (iv) $\frac{1}{12}$ is the inverse of $\frac{3}{4}$ under $\star$.

Q.5 Let S={1, ω, ω^2}, construct a composition table w.r.t. multiplication on $\mathbb{C}$ and show that:
(i) S holds associative law (ii) 1 is the identity element in S (iii) each element of S has an inverse in S

Q.6 Let A={0,1,2,3}, a binary operation is defined by a$\star$b=a, $\forall$a,b ϵ A. Construct the multiplication table for $\star$ in A.

Q.7 Let $\star$ be defined in $\mathbb{Z}$ by a$\star$b=a+b+3. Show that:
(i) $\star$ is associative and commutative (ii) identity w.r.t. $\star$ exists in $\mathbb{Z}$ (iii) every element of $\mathbb{Z}$ has inverse under $\star$

Q.8 Is ($\mathbb{Q}^+$,$\star$) a group if $\star$ is defined by a$\star$b = $\frac{ab}{3}$, $\forall$a,b ϵ $\mathbb{Q}^+$?

Q.9 show that S={1, -1, i, $-i$} form a finite abelian group w.r.t. the usual multiplication of complex numbers.

CHAPTER # 06 SEQUENCES AND SERIES (Assignment #06)

Multiple Choice Questions:

1. The missing element of the series -5, 5, 15, . . . 35 is _________.
   a. 45 b. 20 c. 25 d. none of these
2. The 10^{th} term of the sequence 13, 7, 1, . . . is ___________.
   a. -41 b. -51 c. -61 d. none of these
3. The 9^{th} term of the sequence $\frac{1}{3}, \frac{1}{5}, \frac{1}{7}$, . . . is ________.
   a. $\frac{1}{14}$ b. $\frac{1}{17}$ c. $\frac{1}{19}$ d. none of these
4. If $S_n = n^2$ then sum of 9 terms in an A.P is __________.
   a. 90 b. 120 c. 81 d. none of these
5. If the 2^{nd} and 3^{rd} term of an A.P. are 13 and 21, then its 5^{th} term is _________.
   a. 37 b. 40 c. 57 d. none of these
6. If 6, $3x$, $4x$ are in A.P. the x= _________.
   a. 1 b. 2 c. 3 d. none of these
7. If the first term of G.P. is 50 and its common ratio is $\frac{4}{9}$ then its sum to infinity is ___________.
   a. 80 b. 90 c. 100 d. 110
8. If the sum of three numbers in A.P. is 30 and the product of extremes is 96, then the numbers are:
   a. 4,6,8 b. 5,9,13 c. 8, 10, 12 d. none of these
9. The harmonic mean of $\frac{1}{3}$ and $\frac{2}{5}$ is _________.
   a. $\frac{4}{11}$ b. $\frac{4}{9}$ c. $\frac{11}{4}$ d. none of these
10. The 3^{rd} term in A.P. -5, 5 is _________.
    a. 0 b. 10 c. 15 d. none of these
11. A geometric mean of 15 and 60 is ___________.
    a. ± 30 b. ± 40 c. 40 d. 900
12. The 9^{th} term of 18, -12, 8 , . . . is ___________.
    a. $\frac{512}{729}$ b. $\frac{612}{729}$ c. $\frac{509}{729}$ d. none of these
13. A.M. between 3 and 7 is _________.
    a. 5 b. $\frac{42}{14}$ c. $\frac{5}{21}$ d. $\frac{21}{5}$
14. The sum of the infinite geometric series 2 + 1 + 0.5 + . . . is _________.
    a. 3.5 b. 3 c. 4 d. 5
15. The 5^{th} term of the sequence T_n =2n − 3 is _________.
    a. 13 b. -13 c. 7 d. -7
16. -2, 4, -6, . . . is __________.
    a. H.P. b. G.P. c. A.P. d. A.G.
17. If A, G, H are the arithmetic mean, geometric mean and harmonic mean between 'a' and 'b' respectively, then A,G,H are in ___________.
    a. G.P. b. H.P. c. A.P. d. none of these
18. If 4, a, 16 are in A.P. then the value of 'a' is ____________.
    a. 64 b. ± 8 c. $\sqrt{8}$ d. $\pm\sqrt{8}$
19. The H.M. between 'p' and 'q' is ____________.
    a. $\frac{p+q}{2}$ b. $\frac{p+q}{pq}$ c. $\frac{2pq}{p+q}$ d. $\pm\sqrt{pq}$
20. If A, G, H are respectively the A.M., G.M. and H.M. between 'a' and 'b', then
    a. A^2 = GH b. $G = \frac{A}{H}$ c. $G = \frac{A+H}{2}$ d. $G^2 = AH$

Short-Answer Questions:

Q.1 The 2^{nd}, 31^{st} and last term of an A.P. are $\frac{31}{4}, \frac{1}{2}$ and $-\frac{13}{2}$ respectively. Find the number of terms.

Q.2 Show that the sum of the $(p+q)^{th}$ term and $(p-q)^{th}$ terms of an A.P. is equal to twice the p^{th} term.

Q.3 Prove that $(T_n)^2 + (T_{n-2})^2 - 2(T_{n-1})^2$ is independent of n.

Q.4 If w, x, y and z are in A.P. the show that $w^2 - z^2 = 2(x^2 - y^2)$.

Q.5 Find the sum to 20 terms of an A.P. whose 4^{th} term is 7 and 7^{th} term is 13.

Q.6 If the sum of 8 terms of an A.P. is 64 and that of 19 terms is 361. Find the first term, common difference and the sum of 31 terms.

Q.7 How many terms of the series $-9-6-3-...$ make the sum 66.

Q.8 Find the sum of all the natural numbers which are between 250 and 1000 which are divisible by 7.

Q.9 Find the sum of an A.P. of 15 terms whose middle term is -42.

Q.10 Find the first 6 terms of a series of which the sum to n terms is $\frac{1}{2}n(7n-1)$.

Q.11 The sum of the first n terms of two A.P.'s are as $(13-7n):(3n+1)$. Find the ratio of their first term and also of their second terms.

Q.12 Find the three numbers in A.P. whose sum is 12 and the product is 28.

Q.13 The sum of 4 terms in A.P. is 4. The sum of the products of the first and the last terms and of the two middle terms is -38. Find the numbers.

Q.14 The sum of 4 numbers in A.P. is 20. The ratio of the product of the first and the last number and

Q.15 The base of a right angled triangle is 10cm and the sides of the triangle are in A.P. Find the hypotenuse.

Q.16 Which term of the sequence: (i) 18, 12, 8, . . . is $\frac{512}{729}$? (ii) $\frac{1}{4},-\frac{1}{2},1,...$ is -128?

Detailed-Answer Questions:

Q.17 Find the sum of all natural numbers between 1 and 100 which are not exactly divisible by 2 or 3.

Q.18 Find the sum of an A.P. of 17 terms whose middle term is 5.

Q.19 Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may become the A.M. between a and b.

Q.20 If in a G.P. the 5th term is 9 times the 3rd term and its second term 6, find the G.P.

Q.21 In a G.P., the first term is 7, the last term is 448 and the sum is 889. Find the common ratio and the number of terms.

Q.22 Find the sum of the first n terms of the following series:
(i) 2 + 22 + 222 + . . . (ii) 0.6 + 0.66 + 0.666 + . . .

Q.23 If a rubber ball that is dropped on the floor from a height of 27metres always rebounds one-third of the distance of the previous fall, find the distance it will have covered before hitting the ground for the 9th time.

Q.24 The first 3 terms of a G.P. are (x+10), (x-2), (x-10) respectively. Find 'x' and hence the sum to infinity if this series.

Q.25 The 3rd term of a G.P. is 27 and the 6th term is 8. Find the sum to infinity.

Q.26 Find the G.P. whose 2nd term is 2 and the sum to infinity is 8.

Q.27 Express the recurring decimals as a common fraction: (i) $0.9\dot{7}$ (ii) $0.3\dot{4}\dot{8}$ (iii) $4.\dot{1}2\dot{3}$

Q.28 The sum of infinite series of a G.P. is 56 and the sum of the squares is 448. Find the G.P.

Q.29 The first two terms of an infinite G.P. add up to 1 and every term is twice the sum of all the terms that follow it. Find the series and also its sum to infinity.

Q.30 Determine the sum of an infinite decreasing geometric series, if it is known that the sum of its first and fourth terms is equal to 54 and the sum of the second and third terms is 36.

Q.31 The product of three numbers in G.P. is 216 and the sum of their product in pairs is 156, find the numbers.

Q.32 Show that the product of n geometric means between a and b is $(ab)^{\frac{n}{2}}$.

Q.33 If the 3rd, 6th and the last term of an H.P. are respectively $\frac{1}{3},\frac{1}{5}$ and $\frac{3}{203}$; find the number of terms.

Q.34 Find the 17th term of an H.P. whose first two terms are 6 and 8.

Q.35 Which term of the H.P.: (i) 6, 2, $\frac{6}{5}$, . . . is equal to $\frac{2}{33}$? (ii) 12, $\frac{4}{13}$, $\frac{2}{9}$, . . . is equal to $\frac{1}{42}$?

Q.36 Insert four harmonic means between 12 and $\frac{48}{5}$.

Q.37 If the pth term of an H.P. is q and qth term is p. Prove that the (p+q)th term is $\frac{pq}{p+q}$ and find the (pq)th term.

Q.38 Prove that a, b, c are in A.P., G.P. or H.P. according as $\frac{a-b}{b-c}=\frac{a}{a}$ or $\frac{a}{b}$ or $\frac{a}{c}$.

Q.39 Simplify $\frac{x(y-z)}{x-y}$, where x, y, z are in: (i) A.P. (ii) G.P. (iii) H.P.

Q.40 Find the G.P. whose third term is $\frac{9}{4}$ and whose sixth term is $\frac{243}{32}$.

Q.41 If the sum of p terms of an A.P. is q and the sum of q terms is p. Find the sum of (p+q) terms.

Q.42 If x, y, z are respectively the mth, pth, qth terms of a G.P. Show that $x^{p-q}.y^{q-m}.z^{m-p}=1$

CHAPTER # 07 **(Assignment #07)**

PERMUTATIONS, COMBINATIONS AND INTRODUCTION TO PROBABILITY

Multiple Choice Questions:

1. The value of ${}^5P_3$ is ________.
   a. 120 b. 60 c. 20 d. 80
2. $\frac{(n+1)!}{(n-1)!} =$________.
   a. n b. (n-1) c. (n+1) d. n(n+1)
3. The value of 0! Is _________.
   a. 0 b. 1 c. ∞ d. none of these
4. The value of $\binom{5}{3,2}$ is ________.
   a. 10 b. $\frac{5}{6}$ c. 1 d. 20
5. The probability of getting the tail in a single toes of a coin is ________.
   a. $\frac{1}{3}$ b. $\frac{1}{2}$ c. $\frac{2}{3}$ d. 2
6. The value of ${}^{13}C_{11}$ is _____________.
   a. 77 b. 11! c. 13! d. 78
7. If a balanced die is rolled then the probability of getting 2 or 5 is _________.
   a. $\frac{1}{2}$ b. $\frac{1}{3}$ c. $\frac{1}{6}$ d. $\frac{2}{5}$
8. The formula for ${}^nC_r$ is ________.
   a. $\frac{n!}{r!(n-r)!}$ b. $\frac{n!}{(n-r)!}$ c. $\frac{n!}{r!}$ d. $\frac{(n-r)!r!}{n!}$
9. The formula for ${}^nP_r$ is ________.
   a. $\frac{n!}{r!(n-r)!}$ b. $\frac{n!}{(n-r)!}$ c. $\frac{n!}{r!}$ d. $\frac{(n-r)!r!}{n!}$
10. The value of $\frac{5!}{3!}$ is ________.
    a. 20 b. 10 c. 4! d. 5!
11. How many three letters word can be formed by using all letters of the word ENGLISH?
    a. 5040 b. 720 c. 210 d. none of these
12. The number of arrangement that can be made by the letters of the word NUMBER are _______.
    a. 640 b. 720 c. 800 d. 840
13. If P(A) =$\frac{1}{6}$ then P(A') = ________.
    a. $\frac{5}{6}$ b. $\frac{4}{5}$ c. $\frac{3}{2}$ d. none of these
14. If A and B be two independent events and if P(A) = 0.6 and P(B) = 0.25 the P(A∩B) = ________.
    a. 0.85 b. 0 c. 0.15 d. 0.625
15. From a bag containing 4 white and 5 black balls, one ball is drawn at random, the probability that it is a black ball is __________.
    a. $\frac{4}{9}$ b. $\frac{5}{9}$ c. $\frac{1}{9}$ d. $\frac{7}{9}$
16. The probability the A person will alive is 0.7 then the probability the he will die is ________.
    a. 1 b. 0.3 c. 0.5 d. none of these
17. If A and B are not mutually inclusive event the P(AUB) = _______.
    a. P(A)+P(B)—P(A∩B) b. P(A)+P(B)+P(A∩B) c. P(A)+P(B) d. none of these
18. The probability that a slip of number divisible by 4 is picked from the slips bearing numbers 1,2,3, . . .10 is ___.
    a. $\frac{1}{4}$ b. $\frac{1}{5}$ c. $\frac{1}{3}$ d. none of these
19. If A and B are independent events the P(A∩B) = ___________.
    a. P(A)+P(B)—P(A∩B) b. P(A)+P(B) c. P(A).P(B) d. none of these
20. If A and B are not mutually exclusive event the P(AUB) = _______.
    a. P(A)+P(B)—P(A∩B) b. P(A)+P(B)+P(A∩B) c. P(A)+P(B) d. none of these

Short-Answer Questions:

Q.1 If ${}^nP_3 = 12.\ {}^{\frac{n}{2}}P_3$, find n. Q.2 Find n, is ${}^{2n}P_3 = 2.\ ({}^nP_4)$. Q.3 If ${}^{18}C_r = {}^{18}C_{r+2}$, find ${}^rC_5$.

Q.4 Find n, if ${}^{2n}C_3 : {}^nC_2 = 44 : 3$

Q.5 How many natural numbers of 4-digit can be formed with the 4-digits 2,3,5,7, no digit being used more than once is each number? What will be the numbers if the given digits are 2,3,5,0? Write all the numbers so formed.

Q.6 How many different numbers of 3 different digits can be formed using the digits 1,2,3,4,5,7 is each number is to be: (i) odd (ii) even

Q.7 Find the total number of ways in which 5 sparrows can perch on 3 trees, when there is no restriction to the choice of tree. In how many of these ways will one particular sparrow be alone on a tree?

Q.8 Find the number of permutations of the letters of each of the following words, all taken together :

(i) PERMUTATION (ii) PARALLELOGRAM (iii) COMMITTEE (iv) INSTITUTIONS
(v) INTELLIGENCE (vi) MISSISSIPPI

Q.9 How many natural numbers may be formed by using 4 out of the 5 digits 1,2,3,4,5 if:

(i) the digits are not repeated (ii) the digits may be repeated (iii) each number is even & digits are not repeated

Q.10 In how many ways can 3 chemistry, 2 physics and 2 mathematics books be arranged on a shelf so as to keep all the books in each subject together?

Q.11 A father has 8 children. He takes them 3 at a time to the zoo as often as he can without taking the same 3 children more than once. How often will he go and how often will each child go?

Q.12 If three coins are tossed simultaneously, what is the probability of obtaining:

(i) at least one tail (ii) at least one head (iii) two heads and one tail (iv) all heads
(v) no heads and no tails (vi) the same faces (vii) at most two heads (viii) at least two heads

Q.13 Two dice are rolled simultaneously, what is the probability that:

(i) a double of any kind is obtained (ii) the sum of their points is 9
(iii) the sum of their points is less than 7 (iv) the sum of their points is greater than 10
(v) the sum of their points is even (vi) there is at least one 5

Q.14 A word consists of letters with 5 consonants and 4 vowels. Three letters are chosen at random. What is the probability that more than one vowel will be selected?

Q.15 Two coins are tossed together. Find the probability of getting:

(i) at least one head (ii) exactly one tail

Q.16 A drawer contains 50 bolts and 150 nuts. Half of the bolts are rusted. If one item is chosen at random, what is the probability that it is either rusted or is a bolt?

Q.17 The probability that a student passes mathematics is $\frac{11}{20}$ and the probability the he passes physics is $\frac{13}{20}$. If the probability of passing at least one course is $\frac{17}{20}$, what is the probability that he will pass both courses.

Q.18 If two dice are thrown simultaneously. What is the probability of obtaining a sum of 7 or a sum of 11?

Q.19 Three coins are flipped together. Find the probability of just getting 2 heads or 2 tails?

Q.20 Of the students attending a lecture, 50% could not see what was being written on the black board, 40% could not hear what the lecturer was saying; a particularly unfortunate 30% fell into both of these categories. What is the probability that a student picked at random was able to see and hear satisfactorily?

CHAPTER # 08 MATHEMATICAL INDUCTION AND BINOMIAL THEOREM

(Assignment #08)

Binomial theorem is also known as Umer Khayam Theorem, it was studied by Muslim mathematician Umer Khayam but after words the name was changed by western people to Binomial Theorem.

Multiple Choice Questions:

1. 1+2+3+ . . . + n = _________.
   a. $\frac{n(n+1)}{2}$ b. $\frac{n+1}{2}$ c. $\frac{n+1}{n}$ d. none of these
2. $1^2 + 2^2 + 3^2 + . . . n^2$ = _________.
   a. $\frac{n(n+1)(2n+1)}{6}$ b. $\frac{(n+1)(2n+1)}{2}$ c. $\frac{(n+1)(2n+1)}{3}$ d. none of these
3. $1^3 + 2^3 + 3^3 + . . . n^3$ = _________.
   a. $\frac{n^2(n+1)^2}{4}$ b. $\frac{n^2(n+1)^2}{2}$ c. $\frac{n^2(n+1)^2}{3}$ d. none of these
4. $\sum_{k=1}^{n} K =$ _________.
   a. $\frac{n(n+1)}{2}$ b. $\frac{n+1}{2}$ c. $\frac{n+1}{n}$ d. none of these
5. $\sum_{k=1}^{n} k^2 =$ _________.
   a. $\frac{n(n+1)(2n+1)}{6}$ b. $\frac{(n+1)(2n+1)}{2}$ c. $\frac{(n+1)(2n+1)}{3}$ d. none of these
6. $\sum_{k=1}^{n} k^3 =$ _________.
   a. $\frac{n^2(n+1)^2}{4}$ b. $\frac{n^2(n+1)^2}{2}$ c. $\frac{n^2(n+1)^2}{3}$ d. none of these
7. If n is a natural number, the middle term in the expansion of $(a + b)^{2n}$ is ______.
   a. $\left(\frac{n}{2}\right)^{th}$ term b. $\left(\frac{n+2}{2}\right)^{th}$ term c. $(n+1)^{th}$ term d. none of these
8. The number of terms in the binomial expansion of $(3x + 2y)^9$ is _________.
   a. 8 b. 9 c. 10 d. 11
9. The sum of series $(1 + x + x^2 + x^3 + . . .)$ = ______.
   a. $(1 + x)^{-1}$ b. $(1 - x)^{-1}$ c. $(1 + x)^{-2}$ d. $(1 - x)^{-2}$
10. The sum of series $(1 + 2x + 3x^2 + 4x^3 + . . .)$ = ______.
    a. $(1 + x)^{-1}$ b. $(1 - x)^{-1}$ c. $(1 + x)^{-2}$ d. $(1 - x)^{-2}$
11. The binomial coefficients of 2^{nd} term in $(1 + x)^n$ is _________.
    a. 1 b. n c. $\frac{n(n-1)}{2!}$ d. none of these
12. The binomial coefficient of 3^{rd} term in $(1 + x)^n$ is _________.
    a. 1 b. n c. $\frac{n(n-1)}{2!}$ d. none of these
13. The binomial coefficient of 6^{th} term in $(1 + x)^n$ is _________.
    a. 1 b. n c. $\frac{n(n-1)}{2!}$ d. none of these
14. The binomial coefficient of 7^{th} term in $(1 + x)^n$ is _________.
    a. 1 b. n c. $\frac{n(n-1)}{2!}$ d. none of these
15. The general term of binomial expansion $(a + b)^n$ is _________.
    a. $\binom{n}{r} a^{n-r} b^r$ b. $\binom{n}{r} a^n b^{n-r}$ c. $\binom{n}{r} a^n b^r$ d. none of these

Short-Answer Questions:

Q.1 Prove the following propositions by Mathematics Induction:

(i) 2 + 5 + 8 + . . . + (3n-1) = $\frac{n}{2}$(3n+1)
(ii) 2 + 4 + 6 + . . . + 2n = n(n+1)
(iii) 2 + 6 + 12 + . . . + n(n+1) = $\frac{1}{3}$n(n+1)(n+2)
(iv) $1^2 + 3^2 + 5^2 + . . . + (2n-1)^2 = \frac{1}{3}$n(2n-1)(2n+1)
(v) $2^2 + 4^2 + 6^2 + . . . + (2n)^2 = \frac{2}{3}$n(n+1)(2n+1)
(vi) $1^2 + 2^2 + 3^2 + . . . + n^2 = \frac{1}{6}$n(n+1)(2n+1)
(vii) $2^3 + 4^3 + 6^3 + . . . + (2n)^3 = 2[n(n+1)]^2$
(viii) 1.3 + 2.4 + 3.5 + . . . + n(n+2) = $\frac{1}{6}$n(n+1)(2n+7)
(ix) 1.2.3 + 2.3.4+ 3.4.5 + . . . + n(n+1)(n+2) = $\frac{1}{4}$n(n+1)(n+2)(n+3)
(x) $\frac{1^2}{1.3} + \frac{2^2}{3.5} + . . . + \frac{n^2}{(2n-1)(2n+1)} = \frac{n(n+1)}{2(2n+1)}$
(xi) $a + ar + ar^2 + . . . + ar^{n-1} = \frac{a(1-r^n)}{1-r}$
(xii) $2^{3n+2} - 28n - 4$ is divisible by 49, ∀nϵℕ
(xiii) $3^{2n+2} - 8n - 9$ is divisible by 64, ∀nϵℕ
(xiv) $10^n + 3.4^{n+2} + 5$ is divisible by 9, ∀nϵℕ
(xv) $a^{2n} - b^{2n}$ is divisible by (a+b), for all nϵℕ

Q.2 Without using the calculator, find the sum of:

(i) $11^2+12^2+13^2+\ldots+30^2$ (ii) $16^3+17^3+18^3+\ldots+25^3$

Q.3 Use the binomial theorem (Omer Khayam Theorem) to compute the value of the following:

(i) $(1.01)^6$ (ii) $(1.03)^{\frac{1}{3}}$ (iii) $\sqrt{26}$

Q.4 Find the middle term or terms in the following expansions:

(i) $\left(x-\frac{1}{x}\right)^8$ (ii) $\left(x^2-\frac{1}{x}\right)^7$ (iii) $\left(x-\frac{1}{2x}\right)^8$ (iv) $\left(\frac{2x}{3y}-\frac{3y}{2x}\right)^7$ (v) $\left(\frac{a}{x}-\sqrt{x}\right)^{16}$

Q.5 Write in the simplified form, the term independent of x in the following:

(i) $\left(\frac{4x^2}{3}-\frac{3}{2x}\right)^9$ (ii) $\left(x-\frac{1}{2x}\right)^{10}$ (iii) $\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^6$ (iv) $\left(\sqrt{x}+\frac{2}{x^2}\right)^{10}$

Q.6 Find the first negative term in the expansion of: (i) $(1+2x)^{\frac{5}{2}}$ (ii) $(1+2x)^{\frac{7}{2}}$ (iii) $\left(1+\frac{3x}{2}\right)^{\frac{9}{2}}$

Detailed-Answer Questions:

Q.7 If $|x|<1$, prove that $\frac{\left(1+\frac{2x}{3}\right)^5+\sqrt{4+2x}}{\sqrt{(4+x)^3}}=1-\frac{5}{6}x$ nearly

Q.8 If 'a' be a quantity so small that 'a' may be comparison with b^3. Prove that $\sqrt{\frac{b}{b+a}}+\sqrt{\frac{b}{b-a}}=2+\frac{3a^2}{4b^2}$.

Q.9 Identify the following series as binomial expansions and find their sums:

(i) $1+\frac{3}{4}+\frac{3.5}{4.8}+\frac{3.5.7}{4.8.12}+\ldots$ (ii) $2+\frac{5}{2!.3}+\frac{5.7}{3!.3^2}+\frac{5.7.9}{4!.3^3}+\ldots$

Q.10 Show that: (i) $\sqrt[3]{4}=1+\frac{1}{4}+\frac{1.3}{4.6}+\frac{1.3.5}{4.6.8}+\ldots$ (i) $\sqrt{3}=1+\frac{1}{3}+\frac{1.3}{3^2.2!}+\frac{1.3.5}{3^3.3!}+\ldots$

Q.11 If $y=\frac{3}{4}+\frac{3.5}{4.8}+\frac{3.5.7}{4.8.12}+\ldots$; prove that $y^2+2y-7=0$

Q.12 If $y=2x+3x^2+4x^3+\ldots$; show that $x=\frac{1}{2}y-\frac{1.3}{2^2.2!}y^2+\frac{1.3.5}{2^3.3!}y^3-\frac{1.3.5.7}{2^4.4!}y^4$

Q.13 Find the first 5 terms of $(3-2x)^{-3}$

CHAPTER # 09 FUNDAMENTALS OF TRIGONOMETRY (Assignment #09)

Multiple Choice Questions:

1. The angle 30^0 in radians is _________.
   a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{2}$
2. The angle 45^0 in radians is _________.
   a. $\frac{\pi}{4}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{2}$ d. $\frac{2\pi}{3}$
3. The angle 60^0 in radians is _________.
   a. $\frac{\pi}{3}$ b. $\frac{\pi}{2}$ c. $\frac{2\pi}{3}$ d. $\frac{3\pi}{4}$
4. The angle 90^0 in radians is _________.
   a. $\frac{\pi}{2}$ b. $\frac{2\pi}{3}$ c. $\frac{3\pi}{4}$ d. $\frac{5\pi}{6}$
5. The angle 120^0 in radians is _________.
   a. $\frac{2\pi}{3}$ b. $\frac{3\pi}{4}$ c. $\frac{5\pi}{6}$ d. π
6. The angle 135^0 in radians is _________.
   a. $\frac{3\pi}{4}$ b. $\frac{5\pi}{6}$ c. π d. $\frac{\pi}{6}$
7. The angle 150^0 in radians is _________.
   a. $\frac{5\pi}{6}$ b. π c. $\frac{\pi}{6}$ d. $\frac{\pi}{4}$
8. The angle 180^0 in radians is _________.
   a. π b. $\frac{\pi}{6}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{2}$
9. The angle 330^0 in radians is _________.
   a. $\frac{5\pi}{6}$ b. $\frac{7\pi}{6}$ c. $\frac{11\pi}{6}$ d. $\frac{13\pi}{6}$
10. If $r = 1.01$cm and θ=2.1 radians then value of 's' is _________.
    a. 2.12 cm b. 2.121 cm c. 2.1cm d. 2.2 cm
11. If $s = 30.2$cm and r=2cm then value of θ is _________.
    a. 15.01 radians b. 15.1 radians c. 15.2 radians d. 15.4 radians
12. If $s = 10.2$cm and θ=2 radians then value of r is _________.
    a. 5.2cm b. 5.01cm c. 5.02cm d. 5.1cm
13. The angle of $\frac{\pi}{4}$ radians in degree is equal to _________.
    a. 30^0 b. 60^0 c. 45^0 d. 90^0
14. The angle of $\frac{\pi}{4}$ radians in degree is equal to _________.
    a. 60^0 b. 90^0 c. 120^0 d. 150^0
15. The angle of $\frac{\pi}{4}$ radians in degree is equal to _________.
    a. 1^0 b. 2^0 c. 90^0 d. 180^0
16. If cosθ< 0 and sinθ>0 then $\rho(\theta)$ lies in _________ quadrant.
    a. 1st b. 2nd c. 3rd d. 4th
17. If tanθ> 0 and cosθ<0 then $\rho(\theta)$ lies in _________ quadrant.
    a. 1st b. 2nd c. 3rd d. 4th
18. If sinθ> 0 and secθ<0 then $\rho(\theta)$ lies in _________ quadrant.
    a. 1st b. 2nd c. 3rd d. 4th
19. If cotθ> 0 and secθ<0 then $\rho(\theta)$ lies in _________ quadrant.
    a. 1st b. 2nd c. 3rd d. 4th
20. If 0<cotθ<1 then $\rho(\theta)$ lies in _________ quadrant.
    a. 1st b. 2nd c. 3rd d. 4th

Short-Answer Questions:

Q.1 How far does a boy on a bicycle travel in 15 revolutions if the diameter of the wheels of his bicycle each equal to 56cm?

Q.2 If a point on the rim of 24cm, diameter fly wheel travels 5040 metres in a minute, through how many radians does the wheel turn in a second?

Q.3 A belt 24.75m long passes around a 3.5cm diameter pulley. As the belt makes three complete revolutions in one minute, how many radians does the wheel turn in one second?

Q.4 Find the arc length of a circle whose diameter is 28cm and whose central angle of measure 41^0.

Q.5 Find the remaining trigonometric angles in the following, if:

(i) sinθ=0.6 and $\rho(\theta)$ is in the second quadrant.

(ii) sinθ=$-\frac{\sqrt{3}}{2}$ and $\rho(\theta)$ is in the third quadrant.

(iii) cosθ=$\frac{2}{\sqrt{5}}$ and $\rho(\theta)$ is in the fourth quadrant.

(iv) tanθ= $\frac{5}{12}$ and $\rho(\theta)$ is in the third quadrant.

(v) cotθ= -2 and $\rho(\theta)$ is in the second quadrant.

(vi) secθ= $\sqrt{2}$ and $\rho(\theta)$ is in the fourth quadrant.

CHAPTER # 10 TRIGONOMETRIC IDENTITIES (Assignment #10)

Multiple Choice Questions:

1. $\frac{1}{1+tan^2\theta} =$ ________.
   a. $-sec^2\theta$ b. $cos^2\theta$ c. $sec^2\theta$ d. $cot^2\theta$
2. $\frac{1}{1+cot^2\theta} =$ ________.
   a. $-cosec^2\theta$ b. $sin^2\theta$ c. $cosec^2\theta$ d. $tan^2\theta$
3. cot($-\theta$) = ________.
   a. $-$cotθ b. $-$tanθ c. $\frac{1}{cot\theta}$ d. $\frac{1}{tan\theta}$
4. tan($-\theta$) = ________.
   a. $\frac{1}{tan\theta}$ b. -tanθ c. $-cot\theta$ d. $\frac{1}{cot\theta}$
5. sin($-\theta$) = ________.
   a. $-\frac{1}{sin\theta}$ b. -sinθ c. $-cosec\theta$ d. $\frac{1}{cosec\theta}$
6. cos($-\theta$) = ________.
   a. $-\frac{1}{cos\theta}$ b. $-$cosθ c. $-sec\theta$ d. $-\frac{1}{sec\theta}$
7. sec($-\theta$) = ________.
   a. $-\frac{1}{sec\theta}$ b. $-sec\theta$ c. $sec\theta$ d. $\frac{1}{cos\theta}$
8. cosec($-\theta$) = ________.
   a. $-\frac{1}{cosec\theta}$ b. $-cosec\theta$ c. $cosec\theta$ d. $\frac{1}{sin\theta}$
9. The distance between (1,1) and (4,5) is:
   a. 4 b. 3 c. 5 d. 2
10. $cosU + cosV =$ ________.
    a. $2cos\frac{U+V}{2}cos\frac{U-V}{2}$ b. $-2sin\frac{U+V}{2}sin\frac{U-V}{2}$ c. $2sin\frac{U+V}{2}cos\frac{U-V}{2}$ d. $2cos\frac{U+V}{2}sin\frac{U-V}{2}$
11. $sunU + sinV =$ ________.
    a. $2cos\frac{U+V}{2}cos\frac{U-V}{2}$ b. $-2sin\frac{U+V}{2}sin\frac{U-V}{2}$ c. $2sin\frac{U+V}{2}cos\frac{U-V}{2}$ d. $2cos\frac{U+V}{2}sin\frac{U-V}{2}$

Short-Answer Questions:

Q.1 Prove that:

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

(iv) $sin^6\theta + cos^6\theta = 1 - 3sin^2\theta cos^2\theta$ (v) $\frac{sin\theta}{1-cot\theta} + \frac{cos\theta}{1-tan\theta} = sin\theta + cos\theta$

(vi) $\frac{cot\theta+cosec\theta}{sin\theta+tan\theta} = cosec\theta cot\theta$ (vii) $\frac{tan\theta+sin\theta}{cosec\theta+cot\theta} = tan\theta sin\theta$ (viii) $\sqrt{\frac{1-sin\theta}{1+sin\theta}} = sec\theta - tan\theta$

(ix) $\sqrt{\frac{1-cos\theta}{1+cos\theta}} = cosec\theta - cot\theta$ (x) $\frac{cos\theta}{sin\theta} - \frac{cosec\theta}{cos\theta} = -tan\theta$ (xi) $\cos(\alpha+\beta)\cos(\alpha-\beta) = cos^2\alpha - sin^2\beta$

(xii) $\cos(\theta+\emptyset)\cos(\theta-\emptyset) = cos^2\theta - sin^2\emptyset$ (xiii) $\sin(\alpha+\beta)\sin(\alpha-\beta) = sin^2\alpha - sin^2\beta$

(xiv) $\sin(\theta+\emptyset)\sin(\theta-\emptyset) = sin^2\theta - sin^2\emptyset$ (xv) $\frac{sin7\theta-sin5\theta}{cos7\theta-cos5\theta} = tan\theta$

(xvi) $\frac{sin\theta+sin3\theta+sin5\theta}{cos\theta+cos3\theta+cos5\theta} = tan3\theta$ (xvii) $1+cos2\theta = \frac{2}{1+tan\theta}$ (xvii) $sin3\theta = 2sin\theta - 4sin^3\theta$

(xix) $cos3\theta = 4cos^3\theta - 3cos\theta$ (xx) $tan3\theta = \frac{3tan\theta - tan^3\theta}{1-3tan^2\theta}$ (xxi) $cos4\theta = 8cos^4\theta - 8cos^2\theta + 1$

(xxii) $sin4\theta = 4sin\theta cos^3\theta - 4sin^3\theta cos\theta$ (xxiii) $\frac{sin2\theta}{sin\theta} - \frac{cos2\theta}{cos\theta} = sec\theta$ (xxiv) $\frac{sin3\theta}{sin\theta} - \frac{cos3\theta}{cos\theta} = 2$

(xxv) $\frac{sin3\theta}{sin\theta} + \frac{cos3\theta}{cos\theta} = 2cot\theta$ (xxvi) $\frac{sin\theta}{1+cos\theta} + \frac{1+cos\theta}{sin\theta} = 2cosec\theta$ (xxvii) $\frac{cosec\theta}{cosec\theta-1} + \frac{cosec\theta}{cosec\theta+1} = 2sec^2\theta$

(xxviii) $\frac{sin\alpha-sin\beta}{sin\alpha+sin\beta} = \frac{\tan\left(\frac{\alpha-\beta}{2}\right)}{\tan\left(\frac{\alpha+\beta}{2}\right)}$ (xxix) $\frac{\sin(\theta+\emptyset)}{cos\theta cos\emptyset} = tan\theta + tan\emptyset$ (xxx) $\frac{tan\theta+sin\theta}{sin\theta-tan\theta} = \frac{sec\theta(1+cos\theta)}{1-sec\theta}$

(xxxi) $\tan\frac{\theta}{2} = \frac{sin\theta}{1+cos\theta} = \frac{1-cos\theta}{sin\theta}$ (xxxii) $\cot\frac{\theta}{2} = \sqrt{\frac{1+cos\theta}{1-cos\theta}}$ (xxxiii) $cos\alpha\cos(\alpha-\beta) + sin\alpha\sin(\alpha-\beta) = cos\beta$

(xxxiv) $sin5\theta - sin3\theta + sin2\theta = 4sin\theta cos\frac{3\theta}{2}cos\frac{5\theta}{2}$ (xxxv) $sin7\theta - sin5\theta + sin2\theta = 4sin\theta cos\frac{3\theta}{2}cos\frac{5\theta}{2}$

(xxxvi) $sin6\theta - sin4\theta + sin2\theta = 4sin\theta cos2\theta cos3\theta$ (xxxvii) $\cos\theta+\cos3\theta+\cos5\theta+\cos7\theta = 4\cos\theta\cos2\theta cos4\theta$

(xxxviii) $\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$ (xxxix) $\tan(\alpha-\beta) = \frac{tan\alpha - tan\beta}{1-tan\alpha tan\beta}$

(xxxx) cot$(\alpha-\beta)$ = $\frac{cot\alpha cot\beta-1}{cot\beta-cot\alpha}$ (xxxxi) sunU+sinV = 2sin$\frac{U+V}{2}$cos$\frac{U-V}{2}$ (xxxxii) cosU+cosV = 2cos$\frac{U+V}{2}$cos$\frac{U-V}{2}$

CHAPTER # 11 GRAPHS OF TRIGONOMETRIC FUNCTIONS (Assignment #11)

Multiple Choice Questions:

1. The period of tanθ is _______.
   a. $\frac{\pi}{2}$ b. 2π c. $3\frac{\pi}{2}$ d. π
2. If sinθ =0 then θ= _________.
   a. {2nπ}, n$\epsilon\mathbb{Z}$ b. {(2n+1)π}, n$\epsilon\mathbb{Z}$ c. {nπ}, n$\epsilon\mathbb{Z}$ d. {n$\frac{\pi}{2}$}, n$\epsilon\mathbb{Z}$
3. The period of sin θ is __________.
   a. $\frac{\pi}{2}$ b. 2π c. $3\frac{\pi}{2}$ d. π
4. The period of cosθ is __________.
   a. $\frac{\pi}{2}$ b. 2π c. $3\frac{\pi}{2}$ d. π
5. The period of tan3x is __________.
   a. $3\frac{\pi}{2}$ b. $\frac{\pi}{2}$ c. 2π d. π
6. The period of $\frac{1}{2}$sin2x is __________.
   a. $\frac{\pi}{2}$ b. 2π c. $3\frac{\pi}{2}$ d. π
7. The period of tan3x is __________.
   a. π b. 2π c. 3π d. 4π
8. The period of (sin$x$+cos$x$) is __________.
   a. π b. 2π c. 3π d. 4π
9. The period of $sin\frac{\theta}{2}$ is __________.
   a. π b. 2π c. 4π d. 6π
10. The period of $sin\frac{\theta}{3}$ is __________.
    a. π b. 2π c. 4π d. 6π

Short-Answer Questions:

Q.1 Draw the graph of the following:

(i) sinθ, where $-\pi \le \theta \le \pi$ (ii) sin$(-\theta)$, where $-180^0 \le \theta \le 180^0$ (iii) sin2θ, where $-\pi \le \theta \le \pi$
(iv) $\frac{\theta}{2}$, where $-2\pi \le \theta \le 2\pi$ (v) $\frac{1}{2}sin2\theta$, where $-\pi \le \theta \le \pi$ (vi) cosθ, where $-\pi \le \theta \le \pi$
(vii) cos $(-\theta)$, where $-180^0 \le \theta \le 180^0$ (viii) $cos2\theta$, where $0 \le \theta \le 360^0$(ix) cos$\frac{\theta}{2}$, where $-2\pi \le \theta \le 2\pi$
(x) $\frac{1}{2}cos2\theta$, where $-\pi \le \theta \le \pi$ (v) $tan\theta$, where $-\pi \le \theta \le \pi$

CHAPTER # 12 SOLUTIONS OF TRIANGLES (Assignment #12)

Multiple Choice Questions:

1. If R is the circum-radius of a circum-circle the R=__________.
   - a. $\frac{\Delta}{S}$ b. $\frac{\Delta}{S-a}$ c. $\frac{abc}{4\Delta}$ d. $\frac{4\Delta}{abc}$
2. If the sides of a triangle are 4,3 and 5 units then S= ________.
   - a. 4 b. 12 c. 5 d. 6
3. If a, b, c are the sides if a triangle ABC then in-radius 'r' = _______.
   - a. $\frac{\Delta}{S}$ b. $\frac{\Delta}{S-a}$ c. $\frac{abc}{4\Delta}$ d. $\frac{4\Delta}{abc}$
4. The law of cosine when ∠A is in standard position is ________.
   - a. $a^2 = b^2+c^2 - 2bc\cos\alpha$ b. $b^2 = a^2+c^2 - 2ac.\cos\beta$ c. $c^2 = a^2+b^2 - ab\cos\gamma$ d. none of these
5. The area of triangle ABC is given by __________.
   - a. $ab\sin\alpha$ b. $\frac{1}{2}ab.\sin\alpha$ c. $\frac{1}{2}ab.\sin\gamma$ d. $2ab.\sin\gamma$
6. If a, b, c are the sides if a triangle ABC then escribed-radius 'r_2' opposite to ∠B is _______.
   - a. $\frac{\Delta}{S}$ b. $\frac{\Delta}{S-a}$ c. $\frac{abc}{4\Delta}$ d. $\frac{4\Delta}{abc}$
7. The area of the triangle ABC is given by ___________.
   - a. $\frac{1}{2}a^2\,\frac{\sin\beta.\sin\gamma}{\sin\alpha}$ b. $\frac{1}{2}b^2\,\frac{\sin\alpha.\sin\gamma}{\sin\beta}$ c. $\frac{1}{2}c^2\,\frac{\sin\alpha.\sin\beta}{\sin\gamma}$ d. none of these
8. The law of Sines in the standard position is __________.
   - a. $\frac{a}{\sin\alpha}=\frac{b}{\sin\beta}=\frac{c}{\sin\gamma}$ b. $\frac{\sin\alpha}{a}=\frac{\sin\beta}{b}=\frac{\sin\gamma}{c}$ c. both (a) and (b) d. none of these
9. The law of tangents in the standard form is ____________.
   - a. $\frac{a-b}{a+b}=\frac{\tan\left(\frac{\alpha-\beta}{2}\right)}{\tan\left(\frac{\alpha+\beta}{2}\right)}$ b. $\frac{b-c}{b+c}=\frac{\tan\left(\frac{\beta-\gamma}{2}\right)}{\tan\left(\frac{\beta+\gamma}{2}\right)}$ c. $\frac{c-a}{c+a}=\frac{\tan\left(\frac{\gamma-\alpha}{2}\right)}{\tan\left(\frac{\gamma+\alpha}{2}\right)}$ d. all of these

Short-Answer Questions:

Q.1 An Aero plane is flying at a height of 9000m. If the angle of depression to a field marker measures 23^0. Find the aerial distance.

Q.2 A man is standing on the bank of a river. He observes that the angle subtended by a tree on the opposite bank is 60^0. When he retreats 40m from the bank, he finds measure of the angle to be 30^0. Find the height of the tree and width of the river.

Q.3 Find the length of third side of the triangular building that faces 13.6m along one street and 13m along another street. The angle of intersection between the streets is 72^0.

Q.4 Two hikers start from the same point; one walks 9km heading east, the other one 10km heading 55^0 nort-east. How far apart are they at the end of their walks?

Q.5 Three points A,B,C form a triangle such that the ratio of the measures of their angles is 1:2:3. Find the ratio of the lengths of the sides.

Q.6 A piece of plastic strip 1 metre long is bent to form an isosceles triangle with 95^0 as measure of its largest angle. Find the length of the sides.

Q.7 The three sides of a triangular lot have length 11cm, 14cm and 16cm respectively. Find the measure of its largest angle and the area of the lot.

Q.8 The measure of the two sides of a triangle are 4 and 5 units. Find the third side so that the area of the triangle is 6 square units.

Q.9 Solve the following triangles and also find the area of the triangle.

(i) $\alpha=49^0$, β=40cm, b=20cm (ii) $\alpha=49^0$, $\beta=60^0$, c=39cm (iii) a=5cm, b=10cm, c=13cm

(iv) $\alpha=54^0 58'$, b=70cm, c=58cm (v) a=b=c (vi) $\alpha=51^0$, $\gamma=61^0$, b=$\sqrt{3}$cm (vii) $\alpha=30^0$, $\beta=63^0$, c=7.3cm

Q.10 Find the values of R, r, r_1, r_2, r_3, in the following triangles:

(i) a=2cm, b=3cm, c=4cm (ii) a = b = c

Q.11 Prove that: (i) $r_1 = 4R\sin\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$ (ii) $r_2 = 4R\cos\frac{\alpha}{2}\sin\frac{\beta}{2}\cos\frac{\gamma}{2}$ (iii) $r_3 = 4R\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\sin\frac{\gamma}{2}$

(iv) $r_1 = \frac{a\cos\frac{\beta}{2}\cos\frac{\gamma}{2}}{\cos\frac{\alpha}{2}}$ (v) $r_2 = \frac{b\cos\frac{\alpha}{2}\cos\frac{\gamma}{2}}{\cos\frac{\beta}{2}}$ (vi) $r_3 = \frac{c\cos\frac{\alpha}{2}\cos\frac{\beta}{2}}{\cos\frac{\gamma}{2}}$ (vii) $\Delta=r^2\cot\frac{\alpha}{2}\cot\frac{\beta}{2}\cot\frac{\gamma}{2}$

(viii) $\Delta=4R\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$ (ix) $r_1 = (s-c)\cot\frac{\beta}{2}$ (x) $\frac{\cos\alpha}{a}+\frac{\cos\beta}{b}+\frac{\cos\gamma}{c}=\frac{a^2+b^2+c^2}{2abc}$

Q.12 Show that: (i) $\frac{1}{ab}+\frac{1}{bc}+\frac{1}{ca}=\frac{1}{2rR}$ (ii) $r_1\,r_2\,r_3 = rs^2$ (iii) $r\,r_1 r_2 r_3 = \Delta^2$ (iv) $\frac{1}{r^2}+\frac{1}{{r_1}^2}+\frac{1}{{r_2}^2}+\frac{1}{{r_3}^2}=\frac{a^2+b^2+c^2}{\Delta^2}$

(v) $\frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}=\frac{1}{r}$ (vi) $(r_1 - r)(r_2 - r)(r_3 - r) = 4Rr^2$ (vii) $4R = r_1 + r_2 + r_3 - r$ (viii) $s^2 = r_1r_2 + r_2r_3 + r_3r_1$

Q.13 Prove that OR Derive the formula:

(i) $\frac{a}{sin\alpha} = \frac{b}{sin\beta} = \frac{c}{sin\gamma}$ (ii) $\cos\alpha = \frac{b^2+c^2-a^2}{2bc}$ OR $a^2 = b^2+c^2 - 2bc.cos\alpha$ (iii) $\frac{tan\left(\frac{\alpha-\beta}{2}\right)}{tan\left(\frac{\alpha+\beta}{2}\right)} = \frac{a-b}{a+b}$

(iv) $\sin\frac{\alpha}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$ (v) $\cos\frac{\alpha}{2} = \sqrt{\frac{s(s-a)}{bc}}$ (vi) $\tan\frac{\alpha}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$ (vii) $\Delta = \frac{1}{2}a^2\frac{sin\beta.sin\gamma}{sin\alpha}$

(viii) $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ (ix) $r = \frac{\Delta}{s}$ (x) $r_1 = \frac{\Delta}{s-a}$ (xi) $R = \frac{abc}{4\Delta}$

Q.14 If a=b=c, then prove that: (i) $r : R : r_1 = 1 : 2 : 3$ (ii) $r : R : r_2 = 1 : 2 : 3$ (iii) $r : R : r_3 = 1 : 2 : 3$

CHAPTER # 13 **(Assignment #13)**

INVERSE TRIGONOMETRIC FUNCTIONS AND TRIGONOMETRIC EQUATIONS

Multiple Choice Questions:

1. The principal value of arcsin $\left(-\frac{\sqrt{3}}{2}\right)$ is _________.
   a. $-\frac{\pi}{2}$ b. $-\frac{\pi}{3}$ c. $-\frac{\pi}{4}$ d. $-\frac{\pi}{6}$
2. The principal value of arcCos $\left(\frac{1}{\sqrt{2}}\right)$ is _________.
   a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$
3. The principal value of arctan (∞) is _________.
   a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$
4. The principal value of arcCos$\left(\frac{\sqrt{3}}{2}\right)$ + arcSin $\left(\frac{1}{2}\right)$ is _________.
   a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{6}$
5. The principal value of arcSin$\left(\frac{3}{5}\right)$ + arcCos $\left(\frac{4}{5}\right)$ is _________.
   a. $\frac{9}{25}$ b. $\frac{16}{25}$ c. $\frac{7}{5}$ d. 1
6. The general solution of $2^{cos\theta} = 1$ is ________.
   a. $\left\{2n\pi \pm \frac{\pi}{2}\right\}$ b. $\left\{2n\pi + \frac{\pi}{2}\right\}$ c. $\left\{2n\pi - \frac{\pi}{2}\right\}$ d. $\{2n\pi\}$
7. The general solution of $cos\theta - 2sin\theta = 0$ is ________.
   a. $\left\{n\pi \pm tan^{-1}\left(\frac{1}{2}\right)\right\}$ b. $\left\{n\pi + tan^{-1}\left(\frac{1}{2}\right)\right\}$ c. $\left\{n\pi - tan^{-1}\left(\frac{1}{2}\right)\right\}$ d. $\{n\pi\}$
8. The general solution of $tan2\theta . cot\theta = 3$ is ________.
   a. $\left\{n\pi \pm \frac{\pi}{6}\right\}$ b. $\left\{n\pi + \frac{\pi}{6}\right\}$ c. $\left\{n\pi - \frac{\pi}{6}\right\}$ d. $\{n\pi\}$

Short-Answer Questions:

Q.1 Prove that: (without using Calculator)

(i) $sin\left(acrCos\frac{\sqrt{3}}{2} + arcSin\frac{1}{2}\right) = \frac{\sqrt{3}}{2}$ (ii) $sin(acrCos\theta + arcSin\theta) = 1$ (iii) $arcSin\frac{3}{5} + arcCos\frac{4}{5} = \frac{\pi}{2}$

(iv) $arcSin\theta + arcCos\theta = \frac{\pi}{2}$ (v) $Sin^{-1}x + Sin^{-1}y = Sin^{-1}\left(x\sqrt{1-y^2} + y\sqrt{1-x^2}\right)$

(vi) $Cos^{-1}x = Tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ (vii) $Tan^{-1}x + Tan^{-1}y = Tan^{-1}\left(\frac{x+y}{1-xy}\right)$

(viii) $Tan^{-1}\frac{1}{13} + Tan^{-1}\frac{1}{4} = Tan^{-1}\frac{1}{3}$ (ix) $Tan^{-1}\frac{1}{7} + Tan^{-1}\frac{1}{8} = Tan^{-1}\frac{3}{11}$ (x) $Tan^{-1}\frac{1}{3} + Tan^{-1}\frac{1}{7} = \frac{\pi}{8}$

(xi) $Cot^{-1}x = Cot^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)$

Q.2 Solve the trigonometric equations:

(i) $2\sin^2\theta + 2\sqrt{2}\sin\theta - 3 = 0$ (ii) $\sin\theta + \cos\theta = 1$ (iii) $\sqrt{3}\cos\theta + \sin\theta = 2$ (iv) $\cos\theta + \cos 2\theta + 1 = 0$

(v) $4\sin^2\theta tan\theta + 4sin^2\theta - 3tan\theta - 3 = 0$ (vi) $2\sin^2\theta - 3\sin\theta - 2 = 0$ (vii) $\tan^2\theta + tan\theta - 2 = 0$

(viii) $tan2\theta . \cot\theta = 3$ (ix) $\sqrt{3}tan\theta - sec\theta - 1 = 0$