Tick (✔) the correct answer.

1. **For the propositions p and q, $(p \wedge q) \rightarrow p$ is:**
   (a) ✔Tautology (b) Absurdity (c) contingency (d) None of these
2. **For the propositions p and q , $p \rightarrow (p \vee q)$ is:**
   (a) ✔Tautology (b) Absurdity (c) Contingency (d) None of these
3. **The symbol which is used to denote negation of a proposition is**
   (a) ✔$\sim$ (b) $\rightarrow$ (c) $\wedge$ (d) $\vee$
4. **Truth set of a tautology is**
   (a) ✔Universal set (b) φ (c) True (d) False
5. **A statement which is always falls is called**
   (a) Tautology (b) ✔ Absurdity (c) Contingency (d) Contra positive
6. **$p \rightarrow \sim p$ is**
   (a) Tautology (b) ✔Absurdity (c) Contingency (d) Contra positive
7. **In a proposition if $p \rightarrow q$ *then* $q \rightarrow p$ is called**
   (a) Inverse of $p \rightarrow q$ (b) ✔ converse of $p \rightarrow q$ (c) contrapositive of $p \rightarrow q$ (d) None
8. **Contra positive of $\sim p \rightarrow \sim q$ is**
   (a) $p \rightarrow q$ (b) ✔ $q \rightarrow p$ (c) $\sim p \rightarrow q$ (d) $\sim q \rightarrow p$
9. **The symbol "∃" is called**
   (a) Universal quantifier (b) ✔ Existential quantifier (c) Converse (d) Inverse
10. **The symbol "∀" is called**
    (a) ✔Universal quantifier (b) Existential quantifier (c) Converse (d) Inverse

SHORT QUESTIONS

i. **Write converse , inverse and contra positive of $\sim p \rightarrow q$**
ii. **Construct the truth table of $[(p \rightarrow q) \wedge p \rightarrow q]$**
iii. **Show that $\sim(p \rightarrow q) \rightarrow p$ is tautology.**
iv. **Define Absurdity.**

LONG QUESTIONS

Prove that $p \vee (\sim p \wedge \sim q) \vee (p \wedge q) = p \vee (\sim p \wedge \sim q)$

EXERCISE 2.5

Tick (✔) the correct answer.

1. **Truth set of $p \wedge q$ is**
   (a) ✔$P \cap Q$ (b) $P \cup Q$ (c) $P - Q$ (d) $P + Q$
2. **$P = Q$ is the truth set of**
   (a) $p = q$ (b) $p \rightarrow q$ (c) ✔$p \leftrightarrow q$ (d) $p \Rightarrow q$
3. **Truth set of a tautology is the**
   (a) Power set (b) Subset (c) ✔Universal set (d) Super set

SHORT QUESTIONS

Write logical form of $(A \cap B)' = A' \cup B'$

LONG QUESTIONS

Convert $(A \cup B) \cup C = A \cup (B \cup C)$ into logical form and prove it by constructing the truth table.

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7. $x + a$ is a factor of $x^n + a^n$ when n is
(a) Any integer (b) any positive integer (c) ✔ any odd integer (d) any real number
8. $x - a$ is a factor of $x^n - a^n$ when n is
(a) ✔ Any integer (b) any positive integer (c) any odd integer (d) any real number

SHORT QUESTIONS

i. Find the numerical value of k if the polynomial $x^3 + kx^2 - 7x + 6$ has a remainder of -4, when divided by $x + 2$.
ii. Show that $(x - 2)$ is a factor of $x^4 - 13x^2 + 36$.
iii. When the polynomial $x^3 + 2x^2 + kx + 4$ is divided by $x - 2$, the remainder is 14. Find the value of k.
iv. Use synthetic division to find the quotient and the remainder when the polynomial $x^4 - 10x^2 - 2x + 4$ is divided by $x + 3$.
v. Use factor theorem to determine if $x + a$ is a factor of $x^n + a^n$, where n is odd integer.

LONG QUESTIONS

Use synthetic division to find the values of p and q if $x + 1$ and $x - 2$ are factors of the polynomial $x^3 + px^2 + qx + 6$.

Find the values of a and b if -2 and 2 are the roots of the polynomial $x^3 - 4x^2 + ax + b$.

EXERCISE 4.6

Tick (✔) the correct answer.

1. Sum of roots of $ax^2 - bx - c = 0$ is $(a \neq 0)$
(a) $\frac{b}{a}$ (b) $-\frac{b}{a}$ (c) $\frac{c}{a}$ (d) ✔ $-\frac{c}{a}$
2. Product of roots of $ax^2 - bx - c = 0$ is $(a \neq 0)$
(a) ✔ $\frac{b}{a}$ (b) $-\frac{b}{a}$ (c) $\frac{c}{a}$ (d) $-\frac{c}{a}$
3. If 2 and -5 are roots of a quadratic equation , then equation is
(a) $x^2 - 3x - 10 = 0$ (b) $x^2 - 3x + 10 = 0$ (c) ✔ $x^2 + 3x - 10 = 0$ (d) $x^2 + 3x + 10 = 0$
4. If α and β are the roots of $3x^2 - 2x + 4 = 0$, then the value of $\alpha + \beta$ is:
(a) ✔ $\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) $\frac{4}{3}$ (d) $-\frac{4}{3}$
5. The equation whose roots are given is
(a) $x^2 + Sx + P = 0$ (b) $x^2 - Sx - P = 0$ (c) $x^2 + Sx - P = 0$ (d) ✔ $x^2 - Sx + P = 0$

SHORT QUESTIONS

i. If α, β are the roots of $3x^2 - 2x + 4 = 0$, find the values of
(a) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (b) $\alpha^2 - \beta^2$
ii. If α, β are the roots of $x^2 - px - p - c = 0$, prove that $(1 + \alpha)(1 + \beta) = 1 - c$
iii. Find the condition that one root of $x^2 + px + q = 0$ is additive inverse of the other.
iv. If α, β are the roots of the equation $ax^2 + bx + c = 0$, form the equations whose roots are α^3, β^3.
v. If the roots of $px^2 + qx + q = 0$ are α and β then prove that $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{p}{q}} = 0$

LONG QUESTIONS

If α and β are the roots of $x^2 - 3x + 5 = 0$, form the equation whose roots are $\frac{1-\alpha}{1-\beta}$ and $\frac{1-\beta}{1+\beta}$.

Find the condition that $\frac{a}{x-a} + \frac{b}{x-b} = 5$ may have roots equal in magnitude but opposite in signs.

EXERCISE 4.7

Tick (✔) the correct answer.

1. **If roots of $ax^2 + bx + c = 0, (a \neq 0)$ are real , then**
(a) ✔Disc≥ 0 (b) Disc< 0 (c) Disc$\neq 0$ (d) Disc≤ 0
2. **If roots of $ax^2 + bx + c = 0, (a \neq 0)$ are complex , then**
(a) Disc≥ 0 (b) ✔ Disc< 0 (c) Disc$\neq 0$ (d) Disc≤ 0
3. **If roots of $ax^2 + bx + c = 0, (a \neq 0)$ are equal , then**
(a) ✔Disc$= 0$ (b) Disc< 0 (c) Disc$\neq 0$ (d) None of these
4. **The expression $b^2 - 4ac$ is called:**
(a) ✔Discriminant (b) Quadratic equation (c) Linear equation (d) roots
5. **Disc of $x^2 + 2x + 3 = 0$ is**
(a) 16 (b) -16 (c) ✔ -8 (d) -16

SHORT QUESTIONS

i. **Discuss the nature of $2x^2 - 5x + 1 = 0$**
ii. **For what values of m will the equation $(m+1)x^2 + 2(m+3)x + 2m + 3 = 0$ have equal root?**
iii. **Show that the roots of the equation $px^2 - (p-q)x - q = 0$ will be rational.**

LONG QUESTIONS

Show that the roots of $x^2 + (mx + c)^2 = a^2$ will be equal if $c^2 = a^2(1 + m^2)$

Show that the roots of the equation $(a^2 - bc)x^2 + 2(b^2 - ca)x + c^2 - ab = 0$ will be equal, if either
$$a^3 + b^3 + c^3 = 3abc \quad \text{or } b = 0.$$

EXERCISE 4.8

LONG QUESTIONS

Solve the following systems of equations.

$$x + y = a + b \quad ; \quad \frac{a}{x} + \frac{b}{y} = 2$$

Solve the following systems of equations.

$$x + y = 5 \quad ; \quad x^2 + 2y^2 = 17$$

Solve the following systems of equations.

$$(x+3)^2 + (y-1)^2 = 5 \,; \quad x^2 + y^2 + 2x = 9$$

EXERCISE 4.9

LONG QUESTIONS

Solve the following systems of equations.

$$2x^2 - 8 = 5y^2 \quad ; \quad x^2 - 13 = -2y^2$$

v. Find the sum of 20 terms of the series whose rth term is $3r+1$.

LONG QUESTIONS

If $S_n = n(2n-1)$, then find the series.

The ratio of the sums of n terms of two series in A.P. is $3n+2:n+1$. Find the ratio of the 8th terms.

If S_2, S_3, S_5 are the sums of $2n, 3n, 5n$ terms of an A.P., show that $S_5 = 5(S_3 - S_2)$

Find four numbers in A.P. whose sum is 32 and the sum of whose squares is 276.

If a^2, b^2 and c^2 are in A.P., show that $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

EXERCISE 6.5

LONG QUESTIONS

A clock strikes once when its hour hand is at one , twice when it is at two and so on. How many times does the clock strike in twelve hours.

The sum of interior angles of polygons having sides 3,4,5,… etc form an A.P. Find the sum of interior angles for a 16 sided polygon.

EXERCISE 6.6

Tick (✔) the correct answer.

1. **For any $G.P.$, the common ratio r is equal to:**
(a) ✔ $\frac{a_n}{a_{n+1}}$ (b) $\frac{a_{n-1}}{a_n}$ (c) $\frac{a_n}{a_{n-1}}$ (d) $a_{n+1} - a_n, n \in N, n > 1$
2. **No term of a $G.P.$, is:**
(a) ✔ 0 (b) 1 (c) negative (d) imaginary number
3. **The general term of a $G.P.$, is :**
(a) ✔ $a_n = ar^{n-1}$ (b) $a_n = ar^n$ (c) $a_n = ar^{n+1}$ (d) None of these

SHORT QUESTIONS

i. Find the 5th term of G.P., 3,6,12,…
ii. Find the 11th term of the sequence, $1+i, 2, \frac{4}{1+i}, \dots$
iii. Which term of the sequence: $x^2 - y^2, x+y, \frac{x+y}{x-y}, \dots$ is $\frac{x+y}{(x-y)^9}$?
iv. If a, b, c, d are in G.P, prove that $a-b, b-c, c-d$ are in G.P.
v. If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P. show that the common ratio is $\pm\sqrt{\frac{a}{c}}$.

LONG QUESTIONS

Find three, consecutive numbers in G.P whose sum is 26 and their product is 216.

If three consecutive numbers in A.P. are increased by $1, 4, 15$ respectively,

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i. Evaluate $\frac{8!}{7!}$ and $\frac{11!}{2!4!5!}$
ii. Evaluate $\frac{9!}{2!(9-2)!}$ and $4!\ 0!\ 1!$
iii. Write in factorial form: $20.19.18.17$
iv. Write in factorial form: $n(n+1)(n+2)$
v. Write in factorial form: $\frac{(n+1)(n)(n-1)}{3.2.1}$
vi. Prove that $0! = 1$
vii. Write in factorial form: $n(n-1)(n-2)\ \ldots.(n-r+1)$

EXERCISE 7.2

Tick (✔) the correct answer.

1. $20_{P_3} =$
(a) 6890 (b) 6810 (c) ✔ 6840 (d) 6880
2. If $n_{P_2} =$ 30 then $n =$
(a) 4 (b) 5 (c) 6 (d) 10
3. $n_{P_n} =$
(a) n (b) $p!$ (c) ✔ $n!$ (d) $(n-1)!$
4. $n_{P_r} =$
(a) $n!$ (b) $\frac{n!}{r!}$ (c) ✔ $\frac{n!}{(n-r)!}$ (d) $r!$
5. ___________ of n different objects is called permutation.
(a) Combination (b) ✔ Permutation (c) Probability (d) Arrangements
6. In haw many ways the letters of the "$WORD$" can be write?
(a) 2! ways (b) 3! ways (c) ✔ 4! ways (d) 5! ways
7. In how many ways three books can be arranged?
(a) 2! ways (b) ✔ 3! ways (c) 4! ways (d) 5! ways

SHORT QUESTIONS

i. Define "$PERMUTATION$".
ii. Prove that $n_{P_r} = \frac{n!}{(n-r)!}$
iii. Find the value of $11_{P_n} = 11.10.9$
iv. Evaluate 10_{P_7}
v. Prove from the first principle: $n_{P_r} = n.n-1_{P_{r-1}}$
vi. How many words can be formed from the letters of "$FASTING$" using all letters when no letter is to be repeated.

LONG QUESTIONS

Prove that $n_{P_r} = n-1_{P_r} + r.\quad n-1_{P_{r-1}}$

Find the numbers greater than 23000 that can be formed from the digits 1,2,3,5,6, without repeating any digit.

How many 5-digit multiplies of 5 can be formed from the digits 2,3,5,7,9, when no digit is repeated.

EXERCISE 7.3

(a) ✔$|x| < \frac{1}{4}$ (b) $|x| > \frac{1}{4}$ (c) $-1 < x < 1$ (d) $|x| < -1$

SHORT QUESTIONS

i. **Expand $(1+2x)^{-1}$ upto 4 terms, taking the values of x such that the expansion is valid.**

ii. **Expand $(2-3x)^{-2}$ upto 4 terms, taking the values of x such that the expansion is valid.**

iii. **Use Binomial theorem find the value of $(.98)^{\frac{1}{2}}$**

iv. **Use Binomial theorem find the value of $\sqrt[5]{31}$**

v. **Find the coefficient of x^n in the expansion of $\frac{1+x^3}{1-x^2}$**

vi. **Find The coefficient of x^n in the expansion of $\frac{1+x^2}{(1+x)^2}$**

LONG QUESTIONS

If x is so small that its square and higher powers can be neglected , then show that $\frac{\sqrt{4+x}}{(1-x)^3} \approx 2 + \frac{25}{4}x$

If x is so small that its cube and higher powers can be neglected , then show that $\sqrt{1-x-2x^2} \approx 1 - \frac{1}{2}x - \frac{9}{2}x^2$

Show that $\left[\frac{n}{2(n+N)}\right]^{\frac{1}{2}} \approx \frac{8n}{9n-N} - \frac{n+N}{4n}$ **where n and N are nearly equal.**

If x is very nearly equal 1, then prove that $px^p - qx^q \approx (p-q)x^{p+q}$

If $y = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \cdots$, then prove that $y^2 + 2y - 4 = 0$

EXERCISE 9.1

Tick (✔) the correct answer.

1. **Two rays with a common starting point form:**
(a) Triangle (b) ✔ Angle (c) Radian (d) Minute
2. **The common starting point of two rays is called:**
(a) Origin (b) Initial Point (c) ✔ Vertex (d)All of these
3. **If the rotation of the angle is counter clock wise, then angle is:**
(a) Negative (b) ✔ Positive (c) Non-Negative (d) None of these
4. **One right angle is equal to**
(a) ✔$\frac{\pi}{2} radian$ (b) $90°$ (c) $\frac{1}{4} rotation$ (d) All of these
5. **$1°$ is equal to**
(a) 30 minutes (b) ✔ 60 minutes (c) $\frac{1}{60}$ minutes (d) $\frac{1}{2}$ minutes
6. **$1°$ is equal to**
(a) ✔$60'$ (b) $3600''$ (c) $(\frac{1}{360})'$ (d) $60''$
7. **60[th] part of $1°$ is equal to**
(a) One second (b) ✔ One minute (c) 1 Radian (d) π radian
8. **3 radian is:**
(a) ✔171.888° (b) 120° (c) 300° (d) 270°
9. **Area of sector of circle of radius r is:**
(a) $\frac{1}{2}r^2\theta$ (b) ✔ $\frac{1}{2}r\theta^2$ (c) $\frac{1}{2}(r\theta)^2$ (d) $\frac{1}{2r^2\theta}$
10. **Circular measure of angle between the hands of a watch at $4'O\ clock$ is**

vii. **Prove that** $(sin^3\theta - cos^3\theta) = (sin\theta - cos\theta)(1 - sin^2\theta cos^2\theta)$

LONG QUESTIONS

Prove that $sin^6\theta + cos^6\theta = 1 - 3sin^2\theta cos^2\theta$

Prove that $\frac{tan\theta+sec\theta-1}{tan\theta-sec\theta+1} = tan\theta + sec\theta$

EXERCISE 10.1

Tick (✔) the correct answer.

1. **Fundamental law of trigonometry is , $cos(\alpha - \beta)$**

(a) ✔ $cos\alpha cos\beta + sin\alpha sin\beta$ (b) $cos\alpha cos\beta - sin\alpha sin\beta$
(c) $sin\alpha cos\beta + cos\alpha sin\beta$ (d) $sin\alpha cos\beta - cos\alpha sin\beta$

2. **$sin(\alpha + \beta)$ is equal to:**

(a) $cos\alpha cos\beta + sin\alpha sin\beta$ (b) $cos\alpha cos\beta - sin\alpha sin\beta$
(c) ✔ $sin\alpha cos\beta + cos\alpha sin\beta$ (d) $sin\alpha cos\beta - cos\alpha sin\beta$

3. **$cos\left(\frac{\pi}{2} - \beta\right) =$**

(a) $cos\beta$ (b) $-cos\beta$ (c) ✔ $sin\beta$ (d) $-sin\beta$

4. **$sin(2\pi - \theta) =$**

(a) $cos\theta$ (b) $-cos\theta$ (c) ✔ $sin\theta$ (d) $-sin\theta$

5. **$tan(\alpha - \beta) =$**

(a) ✔ $\frac{tan\alpha-tan\beta}{1+tan\alpha tan\beta}$ (b) $\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}$ (c) $\frac{tan\alpha-tan\beta}{1-tan\alpha tan\beta}$ (d) $\frac{tan\alpha+tan\beta}{1-tan\alpha tan\beta}$

6. **Angles associated with basic angles of measure θ to a right angle or its multiple are called:**

(a) Coterminal angle (b) angle in standard position (c) ✔ Allied angle (d) obtuse angle

7. **$sin\left(\frac{3\pi}{2} + \theta\right) =$**

(a) $sin\theta$ (b) $cos\theta$ (c) $-sin\theta$ (d) ✔ $-cos\theta$

8. **$cos\,315°$ is equal to:**

(a) 1 (b) 0 (c) ✔ $\frac{1}{\sqrt{2}}$ (d) $\frac{\sqrt{3}}{2}$

9. **$sin(180° + \alpha)sin(90° - \alpha) =$**

(a) ✔ $sin\alpha cos\alpha$ (b) $-sin\alpha cos\alpha$ (c) $cos\gamma$ (d) $-cos\gamma$

10. **If α, β and γ are the angles of a triangle ABC then $cos\left(\frac{\alpha+\beta}{2}\right) =$**

(a) ✔ $\sin\frac{\gamma}{2}$ (b) $-\sin\frac{\gamma}{2}$ (c) $\cos\frac{\gamma}{2}$ (d) $-\cos\frac{\gamma}{2}$

11. **Which is the allied angle**

(a) ✔ $90° + \theta$ (b) $60° + \theta$ (c) $45° + \theta$ (d) $30° + \theta$

SHORT QUESTIONS

i. **Without using Calculator. Find the value of $Sec(-960°)$**
ii. **Prove that $Sin(180° + \alpha)Sin(90° - \alpha) = -Sin\alpha Cos\alpha$**
iii. **If α, β, γ are angles of triangle ABC, then prove that $Cos\left(\frac{\alpha+\beta}{2}\right) = Sin\frac{\gamma}{2}$**
iv. **Prove that $Cos330°Sin600° + Cos120°Sin150° = -1$**
v. **State "Distance formula".**

LONG QUESTIONS

Prove that $$\frac{sin^2(\pi+\theta)tan\left(\frac{3\pi}{2}+\theta\right)}{Cot^2\left(\frac{3\pi}{2}-\theta\right)Cos^2(\pi-\theta)Cosec(2\pi-\theta)} = Cos\theta$$