EXERCISE - 01 **CHECK YOUR GRASP**

SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

1. The number of solutions of the equation $\frac{\sec x}{1-\cos x}=\frac{1}{1-\cos x}$ in $[0, 2\pi]$ is equal to -

(A) 3 (B) 2 (C) 1 (D) 0

2. The number of solutions of equation $2 + 7\tan^2\theta = 3.25\sec^2\theta (0 < \theta < 360)$ is -

(A) 2 (B) 4 (C) 6 (D) 8

3. The number of solutions of the equation $\tan^2 x - \sec^{10} x + 1 = 0$ in $(0, 10)$ is -

(A) 3 (B) 6 (C) 10 (D) 11

4. If $(\cos\theta + \cos2\theta)^3 = \cos^3\theta + \cos^3 2\theta$, then the least positive value of θ is equal to -

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

5. The number of solution(s) of $\sin2x + \cos4x = 2$ in the interval $(0, 2\pi)$ is -

(A) 0 (B) 2 (C) 3 (D) 4

6. The complete solution of the equation $7\cos^2 x + \sin x \cos x - 3 = 0$ is given by -

(A) $n\pi+\frac{\pi}{2}; (n \in I)$ (B) $n\pi-\frac{\pi}{4}; (n \in I)$

(C) $n\pi+\tan^{-1}\frac{4}{3}; (n \in I)$ (D) $n\pi+\frac{3\pi}{4}, k\pi+\tan^{-1}\frac{4}{3}; (n, k \in I)$

7. If $\cos(\sin x) = 0$, then x lies in -

(A) $\left(\frac{\pi}{4},\frac{\pi}{2}\right)\cup\left(\frac{\pi}{2},\pi\right)$ (B) $\left(-\frac{\pi}{4},0\right)$ (C) $\left(\pi,\frac{3\pi}{2}\right)$ (D) null set

8. If $0 \le \alpha, \beta \le 90$ and $\tan(\alpha + \beta) = 3$ and $\tan(\alpha - \beta) = 2$ then value of $\sin2\alpha$ is -

(A) $-\frac{1}{\sqrt{2}}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{2}$ (D) none of these

9. If $\tan A$ and $\tan B$ are the roots of $x^2 - 2x - 1 = 0$, then $\sin^2(A+B)$ is -

(A) 1 (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{2}$ (D) 0

10. If $\cos2x - 3\cos x + 1 = \frac{\operatorname{cosec} x}{\cot x - \cot 2x}$, then which of the following is true ?

(A) $x=(2n+1)\frac{\pi}{2}, n \in I$ (B) $x = 2n\pi, n \in I$

(C) $x=2n\pi\pm\cos^{-1}\left(\frac{2}{5}\right), n \in I$ (D) no real x

11. The solutions of the equation $\sin x + 3\sin2x + \sin3x = \cos x + 3\cos2x + \cos3x$ in the interval $0 \le x \le 2\pi$, are ;

(A) $\frac{\pi}{8},\frac{5\pi}{8},\frac{2\pi}{3}$ (B) $\frac{\pi}{8},\frac{5\pi}{8},\frac{9\pi}{8},\frac{13\pi}{8}$ (C) $\frac{4\pi}{3},\frac{9\pi}{3},\frac{2\pi}{3},\frac{13\pi}{8}$ (D) $\frac{\pi}{8},\frac{5\pi}{8},\frac{9\pi}{3},\frac{4\pi}{3}$

12. If $x \in \left[-\frac{5\pi}{2},\frac{5\pi}{2}\right]$, then the greatest positive solution of $1 + \sin^4 x = \cos^2 3x$ is -

(A) π (B) 2π (C) $\frac{5\pi}{2}$ (D) none of these

13. Number of values of 'x' in (– 2π, 2π) satisfying the equation $2^{\sin^2 x} + 4.2^{\cos^2 x} = 6$ is -

(A) 8 (B) 6 (C) 4 (D) 2

14. General solution for |sin x| = cos x is -

(A) $2n\pi + \frac{\pi}{4}$, n ∈ I (B) $2n\pi \pm \frac{\pi}{4}$, n ∈ I (C) $n\pi + \frac{\pi}{4}$, n ∈ I (D) none of these

15. The most general solution of tanθ = –1, $\cos\theta = \frac{1}{\sqrt{2}}$ is -

(A) $n\pi + \frac{7\pi}{4}, n \in I$ (B) $n\pi + (-1)^n \frac{7\pi}{4}, n \in I$ (C) $2n\pi + \frac{7\pi}{4}, n \in I$ (D) none of these

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

16. The solution(s) of the equation cos2x sin6x = cos3x sin5x in the interval [0, π] is/are -

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{2}$ (C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$

17. The equation $4\sin^2 x - 2(\sqrt{3}+1)\sin x + \sqrt{3} = 0$ has -

(A) 2 solutions in (0, π) (B) 4 solutions in (0, 2π) (C) 2 solutions in (–π, π) (D) 4 solutions in (–π, π)

18. If $\cos^2 2x + 2\cos^2 x = 1$, x ∈ (–π, π), then x can take the values -

(A) $\pm\frac{\pi}{2}$ (B) $\pm\frac{\pi}{4}$ (C) $\pm\frac{3\pi}{4}$ (D) none of these

19. The solution(s) of the equation sin 7x + cos 2x = –2 is/are -

(A) $x = \frac{2k\pi}{7} + \frac{3\pi}{14}, k \in I$ (B) $x = n\pi + \frac{\pi}{4}, n \in I$ (C) $x = 2n\pi + \frac{\pi}{2}, n \in I$ (D) none of these

20. Set of values of x in (–π, π) for which $|4\sin x - 1| < \sqrt{5}$ is given by -

(A) $\left(\frac{\pi}{10}, \frac{3\pi}{10}\right)$ (B) $\left(-\frac{\pi}{10}, \frac{3\pi}{10}\right)$ (C) $\left(\frac{\pi}{10}, -\frac{3\pi}{10}\right)$ (D) $\left(-\frac{\pi}{10}, -\frac{3\pi}{10}\right)$

CHECK YOUR GRASP — **ANSWER KEY** — EXERCISE-1

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B	A	B	A	D	D	B	C	D
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	B	C	B	C	A,B,D	B,D	A,B,C	C	B

EXERCISE - 02

BRAIN TEASERS

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

1. If $\cos^2x + \cos^2 2x + \cos^2 3x = 1$ then -

(A) $x = (2n+1)\frac{\pi}{4}$, $n \in I$ (B) $x = (2n+1)\frac{\pi}{2}$, $n \in I$ (C) $x = n\pi \pm \frac{\pi}{6}$, $n \in I$ (D) none of these

2. If $4\cos^2\theta + \sqrt{3} = 2(\sqrt{3} + 1)\cos\theta$, then θ is -

(A) $2n\pi \pm \frac{\pi}{3}$, $n \in I$ (B) $2n\pi \pm \frac{\pi}{4}$, $n \in I$ (C) $2n\pi \pm \frac{\pi}{6}$, $n \in I$ (D) none of these

3. Set of values of 'α' in $[0, 2\pi]$ for which $m = \log_{\left(x+\frac{1}{x}\right)}(2\sin\alpha - 1) \le 0$, is -

(A) $\left[\frac{\pi}{6}, \frac{5\pi}{6}\right]$ (B) $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (C) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, \pi\right)$ (D) $\left(\frac{5\pi}{6}, \frac{7\pi}{6}\right)$

4. If $(a+2)\sin\alpha + (2a-1)\cos\alpha = (2a+1)$, then $\tan\alpha =$

(A) $3/4$ (B) $4/3$ (C) $\frac{2a}{a^2+1}$ (D) $\frac{2a}{a^2-1}$

5. If $\theta_1, \theta_2, \theta_3, \theta_4$ are the roots of the equation $\sin(\theta + \alpha) = k \sin 2\theta$, no two of which differ by a multiple of 2π, then $\theta_1 + \theta_2 + \theta_3 + \theta_4$ is equal to -

(A) $2n\pi$, $n \in Z$ (B) $(2n+1)\pi$, $n \in Z$ (C) $n\pi$, $n \in Z$ (D) none of these

6. The number of solution(s) of the equation $\cos 2\theta = \left(\sqrt{2}+1\right)\left(\cos\theta - \frac{1}{\sqrt{2}}\right)$, in the interval $\left(-\frac{\pi}{4}, \frac{3\pi}{4}\right)$, is -

(A) 4 (B) 1 (C) 2 (D) 3

7. The value(s) of θ lying between 0 & 2π satisfying the equation : $r\sin\theta = \sqrt{3}$ & $r + 4\sin\theta = 2(\sqrt{3} + 1)$ is/are -

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$

8. The value(s) of θ, which satisfy $3 - 2\cos\theta - 4\sin\theta - \cos 2\theta + \sin 2\theta = 0$ is/are -

(A) $\theta = 2n\pi$; $n \in I$ (B) $2n\pi + \frac{\pi}{2}$; $n \in I$ (C) $2n\pi - \frac{\pi}{2}$; $n \in I$ (D) $n\pi$; $n \in I$

9. Given that A, B are positive acute angles and $\sqrt{3}\sin 2A = \sin 2B$ & $\sqrt{3}\sin^2 A + \sin^2 B = \frac{\sqrt{3}-1}{2}$, then A or B may take the value(s) -

(A) 15 (B) 30 (C) 45 (D) 75

10. The solution(s) of $4\cos^2x\sin x - 2\sin^2x = 3\sin x$ is/are -

(A) $n\pi$; $n \in I$ (B) $n\pi + (-1)^n\frac{\pi}{10}$; $n \in I$

(C) $n\pi + (-1)^n\left(-\frac{3\pi}{10}\right)$; $n \in I$ (D) none of these

11. If $\left(\frac{1 - a\sin x}{1 + a\sin x}\right)\sqrt{\frac{1 + 2a\sin x}{1 - 2a\sin x}} = 1$, where $a \in R$ then -

(A) $x \in \phi$ (B) $x \in R\ \forall\ a$

(C) $a = 0$, $x \in R$ (D) $a \in R$, $x \in n\pi$, where $n \in I$

12. The general solution of the following equation : $2(\sin x - \cos 2x) - \sin 2x(1 + 2\sin x) + 2\cos x = 0$ is/are -

(A) $x = 2n\pi$; $n \in I$

(B) $n\pi + (-1)^n\left(-\frac{\pi}{2}\right)$; $n \in I$

(C) $x = n\pi + (-1)^n\frac{\pi}{6}$; $n \in I$

(D) $x = n\pi + (-1)^n\frac{\pi}{4}$; $n \in I$

13. The value(s) of θ, which satisfy the equation : $2\cos^3 3\theta + 3\cos 3\theta + 4 = 3\sin^2 3\theta$ is/are -

(A) $\frac{2n\pi}{3}+\frac{2\pi}{9}, n \in I$

(B) $\frac{2n\pi}{3}-\frac{2\pi}{9}, n \in I$

(C) $\frac{2n\pi}{5}+\frac{2\pi}{5}, n \in I$

(D) $\frac{2n\pi}{5}-\frac{2\pi}{5}, n \in I$

14. If $x \neq \frac{k\pi}{2}$, $k \in I$ and $(\cos x)^{\sin^2 x - 4\sin x + 3} = 1$, then all solutions of x are given by -

(A) $n\pi + (-1)^n\frac{\pi}{2}$; $n \in I$

(B) $2n\pi \pm \frac{\pi}{2}$; $n \in I$

(C) $(2n+1)\pi - \frac{\pi}{2}$; $n \in I$

(D) none of these

15. Using four values of θ satisfying the equation $8\cos^4\theta + 15\cos^2\theta - 2 = 0$ in the interval $(0,4\pi)$, an arithmetic progression is formed, then :

(A) The common difference of A.P. may be π.

(B) The common difference of A.P. may be 2π.

(C) Two such different A.P. can be formed.

(D) Four such different A.P. can be formed.

BRAIN TEASERS — ANSWER KEY — EXERCISE-2

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A,B,C	A,C	B	B,D	B	C	A,B,C,D	A,B	A,B	A,B,C
Que.	11	12	13	14	15					
Ans.	C,D	A,B,C	A,B	D	A,D					

EXERCISE - 03 MISCELLANEOUS TYPE QUESTIONS

TRUE / FALSE

1. For all θ in $\left[0, \frac{\pi}{2}\right]$, $\cos(\sin\theta) > \sin(\cos\theta)$.
2. Number of solutions of the equation $\cos(x^2) = 2^{|x|}$ is two.

FILL IN THE BLANKS

1. Number of values of θ in $[0, 2\pi]$ for which vectors $\vec{v}_1 = (2\cos\theta)\tilde{i} - (\cos\theta)\tilde{j} + \tilde{k}$ and $\vec{v}_2 = (\cos\theta)\tilde{i} + 5\tilde{j} + 2\tilde{k}$ are perpendicular is ....
2. The solution set of the system of equations, $x + y = \frac{2\pi}{3}$, $\cos x + \cos y = \frac{3}{2}$, where x & y are real, is ....
3. If $\operatorname{cosec}\theta + \cot\theta = \frac{1}{2}$, then θ lies in .... quadrant.
4. Number of solutions of the equation $\sin5\theta \cos3\theta = \sin9\theta \cos7\theta$ in $\left[0, \frac{\pi}{4}\right]$ is ....

MATCH THE COLUMN

Following question contains statements given in two columns, which have to be matched. The statements in **Column-I** are labelled as A, B, C and D while the statements in **Column-II** are labelled as p, q, r and s. Any given statement in **Column-I** can have correct matching with **ONE** statement in **Column-II**.

1. On the left, equation with interval is given and on the right number of solutions are given, match the column.

	Column-I		Column-II
(A)	$n|\sin x| = m\ |\cos x|$ in $[0, 2\pi]$ where n > m and are positive integers	(p)	2
(B)	$\sum_{r=1}^{5} \cos rx = 5$ in $[0, 2\pi]$	(q)	4
(C)	$2^{1+|\cos x|+|\cos x|^2 ......\infty} = 4$ in $(-\pi, \pi)$	(r)	3
(D)	$\tan\theta + \tan2\theta + \tan3\theta = \tan\theta \tan2\theta \tan3\theta$ in $(0, \pi)$	(s)	1

ASSERTION & REASON

These questions contains, Statement-I (assertion) and Statement-II (reason).
(A) Statement-I is true, Statement-II is true ; Statement-II is correct explanation for Statement-I.
(B) Statement-I is true, Statement-II is true ; Statement-II is NOT a correct explanation for Statement-I.
(C) Statement-I is true, Statement-II is false.
(D) Statement-I is false, Statement-II is true.

1. **Statement-I** : For any real value of $\theta \neq (2n+1)\pi$ or $(2n + 1)\pi/2$, $n\in I$, the value of the expression $y = \frac{\cos^2\theta - 1}{\cos^2\theta + \cos\theta}$ is $y \leq 0$ or $y \geq 2$ (either less than or equal to zero or greater than or equal to two)
Because
Statement-II : $\sec\theta \in (-\infty,-1] \cup [1,\infty)$ for all real values of θ.
(A) A (B) B (C) C (D) D

2. **Statement-I** : The equation $\sqrt{3}\cos x - \sin x = 2$ has exactly one solution in $[0, 2\pi]$.
Because
Statement-II : For equations of type $a\cos\theta + b\sin\theta = c$ to have real solutions in $[0, 2\pi]$, $|c| \leq \sqrt{a^2 + b^2}$ should hold true.
(A) A (B) B (C) C (D) D

COMPREHENSION BASED QUESTIONS

Comprehension # 1 :

Let S_1 be the set of all those solutions of the equation $(1 + a)\cos\theta \cos(2\theta - b) = (1 + a \cos 2\theta) \cos(\theta - b)$ which are independent of a and b and S_2 be the set of all such solutions which are dependent on a and b.

On the basis of above information, answer the following questions :

1. The sets S_1 and S_2 are given by -

(A) $\{n\pi, n \in Z\}$ and $\{m\pi + (-1)^m \sin^{-1}(a \sin b), m \in Z\}$

(B) $\left\{\frac{n\pi}{2}, n \in Z\right\}$ and $\{m\pi + (-1)^m \sin^{-1}(a \sin b), m \in Z\}$

(C) $\left\{\frac{n\pi}{2}, n \in Z\right\}$ and $\{m\pi + (-1)^m \sin^{-1}((a/2)\sin b), m \in Z\}$

(D) none of these

2. Condition that should be imposed on a and b such that S_2 is non-empty -

(A) $\left|\frac{a}{2}\sin b\right| < 1$ (B) $\left|\frac{a}{2}\sin b\right| \le 1$ (C) $|a \sin b| \le 1$ (D) none of these

3. All the permissible values of b, if a = 0 and S_2 is a subset of $(0, \pi)$ is -

(A) $b \in (-n\pi, 2n\pi)$; $n \in Z$ (B) $b \in (-n\pi, 2\pi - n\pi)$; $n \in Z$

(C) $b \in (-n\pi, n\pi)$; $n \in Z$ (D) none of these

MISCELLANEOUS TYPE QUESTION **ANSWER KEY** EXERCISE -3

- ***True / False***

1. T **2.** F

- ***Fill in the Blanks***

1. 2 **2.** ϕ **3.** II quadrant **4.** 5

- ***Match the Column***

1. (A) → (q), (B) → (p), (C) → (q), (D) → (p)

- ***Assertion & Reason***

1. D **2.** B

- ***Comprehension Based Quesions***

Comprehension #1 : **1.** D **2.** C **3.** B

EXERCISE - 04 [A] CONCEPTUAL SUBJECTIVE EXERCISE

1. If sinA = sinB & cosA = cosB, find the values of A in terms of B.
2. Solve the equation : $1 + 2\operatorname{cosec} x = -\dfrac{\sec^2 \frac{x}{2}}{2}$.
3. Solve the equation : $\dfrac{\sqrt{3}}{2}\sin x - \cos x = \cos^2 x$.
4. Solve the equation : $\cot x - 2\sin 2x = 1$.
5. If α & β satisfy the equation, $a\cos 2\theta + b\sin 2\theta = c$ then prove that : $\cos^2\alpha + \cos^2\beta = \dfrac{a^2 + ac + b^2}{a^2 + b^2}$.
6. Solve for x, $\sqrt{13 - 18\tan x} = 6\tan x - 3$, where $-2\pi < x < 2\pi$.
7. Find all the values of θ satisfying the equation : $\sin\theta + \sin 5\theta = \sin 3\theta$ such that $0 \le \theta \le \pi$.
8. Solve : $\cot\theta + \operatorname{cosec}\theta = \sqrt{3}$ for values of θ between 0 & 360 .
9. Solve : $\sin 5x = \cos 2x$ for all values of x between 0 & 180 .
10. Solve the equation : $(1 - \tan\theta)(1 + \sin 2\theta) = 1 + \tan\theta$.
11. Find the general solution of $\sec 4\theta - \sec 2\theta = 2$.
12. Solve the equation : $\cos 3x.\cos^3 x + \sin 3x.\sin^3 x = 0$.
13. Solve for x : $\sin 3\alpha = 4\sin\alpha\sin(x + \alpha)\sin(x - \alpha)$ where α is a constant $\ne n\pi$, $n \in I$.
14. Solve the inequality : $\sin 3x < \sin x$.
15. Solve the inequality : $\tan^2 x - (\sqrt{3} + 1)\tan x + \sqrt{3} < 0$.
16. Find the smallest positive value of x and y satisfying the equations : $x - y = \dfrac{\pi}{4}$ & $\cot x + \cot y = 2$.
17. Find the value(s) of k for which the equation $\sin x + \cos(k + x) + \cos(k - x) = 2$ has real solutions.
18. Solve : $\tan\theta + \tan\left(\theta + \dfrac{\pi}{3}\right) + \tan\left(\theta + \dfrac{2\pi}{3}\right) = 3$.
19. Solve : $\sin 2\theta = \cos 3\theta$, $0 \le \theta \le 360$.
20. Find all values of θ satisfying the equation $\sin 7\theta = \sin\theta + \sin 3\theta$, where $0 \le \theta \le \pi$.

CONCEPTUAL SUBJECTIVE EXERCISE — ANSWER KEY — EXERCISE-4(A)

1. $A = 2n\pi + B$, $n \in I$
2. $x = 2n\pi - \dfrac{\pi}{2}$, $n \in I$
3. $x = 2n\pi \pm \pi$ or $2n\pi + \dfrac{\pi}{3}$, $n \in I$
4. $x = \dfrac{\pi}{8} + \dfrac{K\pi}{2}$ or $x = \dfrac{3\pi}{4} + K\pi$, $K \in I$
6. $\alpha - 2\pi$; $\alpha - \pi$, α, $\alpha + \pi$, where $\alpha = \tan^{-1}\dfrac{2}{3}$
7. $0, \dfrac{\pi}{6}, \dfrac{\pi}{3}, \dfrac{2\pi}{3}, \dfrac{5\pi}{6}$ & π
8. $\theta = 60$
9. $\dfrac{90°}{7}$, 30 , $\dfrac{450°}{7}$, $\dfrac{810°}{7}$, 150 , $\dfrac{1170°}{7}$
10. $n\pi$ or $\left(n\pi - \dfrac{\pi}{4}\right)$, $n \in I$
11. $\theta = \dfrac{2n\pi}{5} \pm \dfrac{\pi}{10}$ or $2n\pi \pm \dfrac{\pi}{2}$, $n \in I$
12. $(2n+1)\dfrac{\pi}{4}$, $n \in I$
13. $n\pi \pm \dfrac{\pi}{3}$, $n \in I$
14. $x \in \left(2n\pi + \dfrac{\pi}{4}, 2n\pi + \dfrac{3\pi}{4}\right) \cup \left(2n\pi - \dfrac{\pi}{4}, 2n\pi\right) \cup \left(2n\pi + \pi, 2n\pi + \dfrac{5\pi}{4}\right)$, $n \in I$
15. $n\pi + \dfrac{\pi}{4} < x < n\pi + \dfrac{\pi}{3}$, $n \in I$
16. $x = \dfrac{5\pi}{12}$, $y = \dfrac{\pi}{6}$
17. $n\pi - \dfrac{\pi}{6} \le k \le n\pi + \dfrac{\pi}{6}$, $n \in I$
18. $\theta = (4n+1)\dfrac{\pi}{12}$; $n \in I$
19. θ = 18 , 90 , 162 , 234 , 270 , 306
20. $0, \dfrac{\pi}{12}, \dfrac{\pi}{3}, \dfrac{5\pi}{12}, \dfrac{7\pi}{12}, \dfrac{2\pi}{3}, \dfrac{11\pi}{12}, \pi$

EXERCISE - 04 [B] BRAIN STORMING SUBJECTIVE EXERCISE

1. Find all values of θ, between 0 & π, which satisfy the equation $\cos\theta\cos2\theta\cos3\theta = 1/4$.

2. Find the general solution of the trigonometric equation :

$$\sqrt{16\cos^4 x - 8\cos^2 x + 1} + \sqrt{16\cos^4 x - 24\cos^2 x + 9} = 2.$$

3. Find the principal solution of the trigonometric equation :

$$\sqrt{\cot 3x + \sin^2 x - \frac{1}{4}} + \sqrt{\sqrt{3}\cos x + \sin x - 2} = \sin\frac{3x}{2} - \frac{\sqrt{2}}{2}.$$

4. Solve : $2\sin\left(3x + \frac{\pi}{4}\right) = \sqrt{1 + 8\sin 2x.\cos^2 2x}$.

5. Solve for x, $(-\pi \le x \le \pi)$ the equation : $2(\cos x + \cos 2x) + \sin 2x(1 + 2\cos x) = 2\sin x$.

6. Solve : $\log_{\frac{-x^2-6x}{10}}(\sin 3x + \sin x) = \log_{\frac{-x^2-6x}{10}}(\sin 2x)$.

7. Find the set of values of 'a' for which the equation, $\sin^4 x + \cos^4 x + \sin 2x + a = 0$ possesses solutions. Also find the general solution for these values of 'a'.

8. Solve : $\cos(\pi . 3^x) - 2\cos^2(\pi . 3^x) + 2\cos(4\pi . 3^x) - \cos(7\pi . 3^x)$

$= \sin(\pi . 3^x) + 2\sin^2(\pi . 3^x) - 2\sin(4\pi . 3^x) + 2\sin(\pi . 3^{x+1}) - \sin(7\pi . 3^x)$

9. Find the least positive angle measured in degrees satisfying the equation :

$\sin^3 x + \sin^3 2x + \sin^3 3x = (\sin x + \sin 2x + \sin 3x)^3$.

10. Solve for x, y : $\begin{cases} \sin x \cos y = \frac{1}{4} \\ 3\tan x = \tan y \end{cases}$.

BRAIN STORMING SUBJECTIVE EXERCISE	ANSWER KEY	EXERCISE-4(B)

1. $\frac{\pi}{8}, \frac{\pi}{3}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{2\pi}{3}, \frac{7\pi}{8}$ **2.** $x \in \left[n\pi + \frac{\pi}{6}, n\pi + \frac{\pi}{3}\right] \cup \left[n\pi + \frac{2\pi}{3}, n\pi + \frac{5\pi}{6}\right]$, $n \in I$

3. $x = \pi/6$ only **4.** $x = 2n\pi + \frac{\pi}{12}$ or $2n\pi + \frac{17\pi}{12}$; $n \in I$ **5.** $\left\{-\pi, -\frac{\pi}{2}, -\frac{\pi}{3}, \frac{\pi}{3}, \pi\right\}$

6. $x = -\frac{5\pi}{3}$ **7.** $\frac{1}{2}\left[n\pi + (-1)^n \sin^{-1}\left(1 - \sqrt{2a+3}\right)\right]$ where $n \in I$ and $a \in \left[-\frac{3}{2}, \frac{1}{2}\right]$

8. $x = \log_3\left(\frac{2k}{3} - \frac{1}{6}\right)$, $k \in N$; $x = \log_3\left(\frac{n}{2}\right)$, $n \in N$; $x = \log_3\left(\frac{1}{8} + \frac{m}{2}\right)$, $m \in N \cup \{0\}$

9. 72 **10.** $\begin{cases} x = (4k+1)\frac{\pi}{4} + \frac{n\pi}{2} + (-1)^{n+1}\frac{\pi}{12} \\ y = (4k+1)\frac{\pi}{4} - \frac{n\pi}{2} - (-1)^{n+1}\frac{\pi}{12} \end{cases}$, $n \in I$

EXERCISE - 05 [A]

JEE-[MAIN] : PREVIOUS YEAR QUESTIONS

1. Find the no. of roots of the equation tan x + sec x = 2 cos x in the interval $[0,2\pi]$ - [AIEEE 2002, IIT 1993]

(1) 1 (2) 2 (3) 3 (4) 4

2. General solution of tan 5θ = cot 2θ is- [AIEEE 2002]

(1) $\theta=\frac{n\pi}{7}+\frac{\pi}{14}$ (2) $\theta=\frac{n\pi}{7}+\frac{\pi}{5}$ (3) $\theta=\frac{n\pi}{7}+\frac{\pi}{2}$ (4) $\theta=\frac{n\pi}{7}+\frac{\pi}{3}, n\in Z$

3. The number of values of x in the interval $[0,3\pi]$ satisfying the equation $2\sin^2 x + 5\sin x - 3 = 0$ is- [AIEEE 2006]

(1) 6 (2) 1 (3) 2 (4) 4

4. If $0 < x < \pi$, and $\cos x + \sin x = \frac{1}{2}$, then tan x is - [AIEEE 2006]

(1) $(4-\sqrt{7})/3$ (2) $-(4+\sqrt{7})/3$ (3) $(1+\sqrt{7})/4$ (4) $(1-\sqrt{7})/4$

5. Let A and B denote the statements

A : $\cos\alpha + \cos\beta + \cos\gamma = 0$

B : $\sin\alpha + \sin\beta + \sin\gamma = 0$

If $\cos(\beta-\gamma) + \cos(\gamma-\alpha) + \cos(\alpha-\beta) = -\frac{3}{2}$, then :- [AIEEE 2009]

(1) Both A and B are true (2) Both A and B are false

(3) A is true and B is false (4) A is false and B is true

6. The possible values of $\theta \in (0, \pi)$ such that $\sin(\theta) + \sin(4\theta) + \sin(7\theta) = 0$ are: [AIEEE 2011]

(1) $\frac{2\pi}{9},\frac{\pi}{4},\frac{4\pi}{9},\frac{\pi}{2},\frac{3\pi}{4},\frac{8\pi}{9}$ (2) $\frac{\pi}{4},\frac{5\pi}{12},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{8\pi}{9}$

(3) $\frac{2\pi}{9},\frac{\pi}{4},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{35\pi}{36}$ (4) $\frac{2\pi}{9},\frac{\pi}{4},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{8\pi}{9}$

PREVIOUS YEARS QUESTIONS **ANSWER KEY** EXERCISE-5 [A]

Que.	1	2	3	4	5	6				
Ans.	2	1	4	2	1	1				

EXERCISE - 05 [B] JEE-[ADVANCED] : PREVIOUS YEAR QUESTIONS

1. The number of integral values of k for which the equation $7\cos x + 5\sin x = 2k + 1$ has a solution is

(A) 4 (B) 8 (C) 10 (D) 12

[JEE 2002 (Screening), 3]

2. $\cos(\alpha - \beta) = 1$ and $\cos(\alpha + \beta) = 1/e$, where $\alpha, \beta \in [-\pi, \pi]$, numbers of pairs of α, β which satisfy both the equations is

(A) 0 (B) 1 (C) 2 (D) 4

[JEE 2005 (Screening)]

3. If $0 < \theta < 2\pi$, then the intervals of values of θ for which $2\sin^2\theta - 5\sin\theta + 2 > 0$, is

(A) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, 2\pi\right)$ (B) $\left(\frac{\pi}{8}, \frac{5\pi}{6}\right)$ (C) $\left(0, \frac{\pi}{8}\right) \cup \left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (D) $\left(\frac{41\pi}{48}, \pi\right)$

[JEE 2006, 3]

4. The number of solutions of the pair of equations

$2\sin^2\theta - \cos 2\theta = 0$

$2\cos^2\theta - 3\sin\theta = 0$

in the interval $[0, 2\pi]$ is [JEE 2007, 3]

(A) zero (B) one (C) two (D) four

5. The number of values of θ in the interval $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ such that $\theta \neq \frac{n\pi}{5}$ for $n = 0, \pm 1, \pm 2$ and $\tan\theta = \cot 5\theta$ as well as $\sin 2\theta = \cos 4\theta$, is [JEE 2010, 3]

6. The positive integer value of $n > 3$ satisfying the equation

$$\frac{1}{\sin\left(\frac{\pi}{n}\right)} = \frac{1}{\sin\left(\frac{2\pi}{n}\right)} + \frac{1}{\sin\left(\frac{3\pi}{n}\right)}$$ is [JEE 2011, 4]

7. Let $\theta, \varphi \in [0, 2\pi]$ be such that

$$2\cos\theta(1 - \sin\varphi) = \sin^2\theta\left(\tan\frac{\theta}{2} + \cot\frac{\theta}{2}\right)\cos\varphi - 1, \quad \tan(2\pi - \theta) > 0 \text{ and } -1 < \sin\theta < -\frac{\sqrt{3}}{2}.$$

Then φ **cannot** satisfy- [JEE 2012, 4]

(A) $0 < \varphi < \frac{\pi}{2}$ (B) $\frac{\pi}{2} < \varphi < \frac{4\pi}{3}$ (C) $\frac{4\pi}{3} < \varphi < \frac{3\pi}{2}$ (D) $\frac{3\pi}{2} < \varphi < 2\pi$

PREVIOUS YEARS QUESTIONS	ANSWER KEY	EXERCISE-5 [B]
1. B 2. D 3. A 4. C 5. 3 6. 7 7. A,C,D		