11-PAPER 1

Single Correct

1. If $x\sin a + y\sin 2a + z\sin 3a = \sin 4a$
$x\sin b + y\sin 2b + z\sin 3b = \sin 4b$
$x\sin c + y\sin 2c + z\sin 3c = \sin 4c$
Then, the roots of the equation
$t^3 - \frac{z}{2}t^2 - \frac{y+2}{4}t + \frac{z-x}{8} = 0,\ a,\ b,\ c \ne n\pi,$ are
(A) $\sin a, \sin b, \sin c$ (B) $\cos a, \cos b, \cos c$
(C) $\sin 2a, \sin 2b, \sin 2c$ (D) $\cos 2a, \cos 2b, \cos 2c$

2. If $u = \sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$, then the difference between the maximum and minimum values of u^2 is given by
(A) $(a-b)^2$ (B) $2\sqrt{a^2+b^2}$
(C) $(a+b)^2$ (D) $2(a^2+b^2)$

3. For $0 < \theta < \frac{\pi}{2}$, the solution(s) of $\sum_{m=1}^{6} \operatorname{cosec}\left(\theta + \frac{(m-1)\pi}{4}\right)\operatorname{cosec}\left(\theta + \frac{m\pi}{4}\right) = 4\sqrt{2}$ is (are)
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$
(C) $\frac{\pi}{12}$ (D) $\frac{7\pi}{12}$

4. Let $S = \left\{x \in (-\pi, \pi) : x \ne 0, \pm\frac{\pi}{2}\right\}$. The sum of all distinct solutions of the equation $\sqrt{3}\sec x + \operatorname{cosec} x + 2(\tan x - \cot x) = 0$ in the set S is equal to
(A) $-\frac{7\pi}{9}$ (B) $-\frac{2\pi}{9}$
(C) 0 (D) $\frac{5\pi}{9}$

5. If a and b are positive numbers ($a < b$), then the range of values of K for which a real λ can be found such that the equation $ax^2 + 2\lambda xy + by^2 + 2K(x + y + 1) = 0$ represents a pair of straight lines is :
(A) $a < K^2 < b$ (B) $a \le K^2 \le b$
(C) $K^2 \le a$ or $K^2 \ge b$ (D) $K \le 2a$ or $K \ge 2b$

6. A triangle ABC is given where vertex A is (1, 1) and the orthocenter is (2, 4). Also sides AB and BC are members of the family of lines $ax + by + c = 0$ where a, b, c are in A.P.

The vertex B is
(A) (2, 1) (B) (1, –2)
(C) (–1, 2) (D) (1, 2)

7. A triangle ABC is given where vertex A is (1, 1) and the orthocenter is (2, 4). Also sides AB and BC are members of the family of lines $ax + by + c = 0$ where a, b, c are in A.P.

Triangle ABC is a/an

(A) obtuse angled triangle
(B) right angled triangle
(C) acute angled triangle
(D) equilateral triangle

8. Let $ax + by + c = 0$ be a variable straight line, where a, b and c are 1st, 3rd and 7th terms of an increasing A.P. Then the variable straight line always passes through a fixed point which lies on

(A) $x^2 + y^2 = 13$
(B) $x^2 + y^2 = 5$
(C) $y^2 = 4x$
(D) $3x + 4y = 9$

9. The value of α for which the points $(\alpha, \alpha + 2)$ is an interior point of the smaller segment of the circle $x^2 + y^2 - 4 = 0$ made by the chord whose equation is $3x + 4y + 12 = 0$

(A) $\left(-\infty, \frac{-20}{7}\right)$
(B) $(-2, 0)$
(C) $\left(-\infty, \frac{-20}{7}\right) \cup (-2, 0)$
(D) None of these

10. The line $x + 2y + a = 0$ intersects the circle $x^2 + y^2 - 4 = 0$ at two distinct points A and B. Another line $12x - 6y - 41 = 0$ intersects the circle $x^2 + y^2 - 4x - 2y + 1 = 0$ at two distinct points C and D.

The value for 'a' so that the line $x + 2y + a = 0$ intersect the circle $x^2 + y^2 - 4 = 0$ at two distinct points A and B is

(A) $-2\sqrt{5} < a < 2\sqrt{5}$
(B) $0 < a < 2\sqrt{5}$
(C) $-\sqrt{5} < a < \sqrt{5}$
(D) $0 < a < \sqrt{5}$

11. The line $x + 2y + a = 0$ intersects the circle $x^2 + y^2 - 4 = 0$ at two distinct points A and B. Another line $12x - 6y - 41 = 0$ intersects the circle $x^2 + y^2 - 4x - 2y + 1 = 0$ at two distinct points C and D.

The equation of circle passing through the points A, B, C and D is

(A) $5x^2 + 5y^2 + 8x + 16y - 36 = 0$
(B) $5x^2 + 5y^2 + 8x - 16y - 36 = 0$
(C) $5x^2 + 5y^2 - 8x - 16y - 36 = 0$
(D) $5x^2 + 5y^2 + 8x - 16y + 36 = 0$

Multiple Choice Questions

12. If $(a - b)\sin(\theta + \phi) = (a + b)\sin(\theta - \phi)$ and $a\tan\frac{\theta}{2} - b\tan\frac{\phi}{2} = c$, then

(A) $b\tan\phi = a\tan\theta$
(B) $a\tan\phi = b\tan\theta$
(C) $\sin\phi = \frac{2bc}{a^2 - b^2 - c^2}$
(D) $\sin\theta = \frac{2ac}{a^2 - b^2 + c^2}$

13. If $\frac{\tan 3A}{\tan A} = k, (k \neq 1)$, then

(A) $\frac{\cos A}{\cos 3A} = \frac{k^2 - 1}{2k}$
(B) $\frac{\sin 3A}{\sin A} = \frac{2k}{k - 1}$
(C) $k < \frac{1}{3}$
(D) $k > 3$

14. The equation of straight line(s) passing through ordered pairs (a, b) satisfying equation $\sec^2(a+2)b+a^2-1=0,\ -\pi<b<\pi$ and having slope $\frac{1}{2}$ is

(A) $x-2y=0$
(B) $x-2y=1$
(C) $x-2y=\pi$
(D) $x-2y+\pi=0$

15. The value of α in $[0, 2\pi]$ so that $x^2+y^2+2\sqrt{\sin\alpha}x+(\cos\alpha-1)=0$ having intercept on x-axis always greater than 2 is/are

(A) $\left(\frac{\pi}{4},\frac{\pi}{2}\right]$
(B) $\left(\frac{\pi}{4},\pi\right]$
(C) $\left(\frac{\pi}{4},\frac{5\pi}{4}\right)$
(D) $[0, \pi]$

Matrix

16.

Column-1	**Column-2**
(1) Number of values of a for which the common chord of the circles $x^2+y^2=8$ and $(x-a)^2+y^2=8$ subtends a right angle at the origin is	(P) 4
(2) A chord of the circle $(x-1)^2+y^2=4$ lies along the line $y=22\sqrt{3}(x-1)$. The length of the chord is equal to	(Q) 2
(3) The number of circles touching all the three lines $3x+7y=2$, $21x+49y=5$ and $9x+21y=1$ are	(R) 0
(4) If radii of the smallest and largest circle passing through the point $(\sqrt{3},\sqrt{2})$ and touching the circle $x^2+y^2-2\sqrt{2}y-2=0$ are r_1 and r_2 respectively, then the mean of r_1 and r_2 is	(S) 1

(A) $1\to P, 2\to Q, 3\to R, 4\to S$
(B) $1\to Q, 2\to P, 3\to R, 4\to S$
(C) $1\to S, 2\to P, 3\to R, 4\to Q$
(D) $1\to Q, 2\to S, 3\to R, 4\to P$

Integer

17. If $x\cos\theta=y\cos\left(\theta+\frac{2\pi}{3}\right)=z\cos\left(\theta+\frac{4\pi}{3}\right)$ then find the value of $xy+yz+zx$.

18. Suppose that $\sin^3 x\sin 3x=\sum_{m=0}^{n} c_m\cos mx$ is an identity in x, where $c_0, c_1, c_2, \ldots\ldots, c_n$ are constants and $c_n\neq 0$, find the value of n.

19. If $ax^2+2hxy+by^2+2gx+2fy+10=0$ represents a pair of straight lines, equidistant from the origin, if $\frac{f^4-g^4}{bf^2-ag^2}$ is equal to $2s$, then $s=\ldots$.

20. Let ABCD be a quadrilateral with area 18, with side AB parallel to the side CD and AB = 2 CD. Let AD be perpendicular to AB and CD. If a circle is drawn inside the quadrilateral ABCD touching all the sides, then its radius is ….

21. The length of common chord of the circles $(x-1)^2+(y+1)^2=4^2$ and $(x+1)^2+(y-1)^2=4^2$ is $2\sqrt{k}$, then $k/2=$

ANSWER KEY

1. (B)	2. (A)	3. (C)	4. (C)	5. (D)	6. (B)	7. (A)
8. (A)	9. (D)	10. (A)	11. (C)	12. (B,C,D)	13. (B, C, D)	14. (ACD)
15. (A,B)	16. (B)	17. (0)	18. (6)	19. (5)	20. (2)	21. (7)