# 11-PAPER 2

## Single Correct

1. The maximum value of $(\cos\alpha_1)\cdot(\cos\alpha_2)....(\cos\alpha_n)$, under the restrictions $0 \le \alpha_1, \alpha_2,...., \alpha_n \le \frac{\pi}{2}$ and $(\cot\alpha_1)\cdot(\cot\alpha_2)....(\cot\alpha_n)=1$ is

(A) $\frac{1}{2^{n/2}}$ (B) $\frac{1}{2^n}$

(C) $\frac{1}{2n}$ (D) 1

**Paragraph for Question Nos. 2 & 3**

2. Consider the equations $5\sin^2 x + 3\sin x\cos - 3\cos^2 x = 2$ …(1), $\sin^2 x - \cos 2x = 2 - \sin 2x$ …(2).

If $\alpha$ is a root of (1) and $\beta$ is a root of (2) then $\tan\alpha + \tan\beta$ can be equal to

(A) $1+\frac{\sqrt{69}}{4}$ (B) $1-\frac{\sqrt{69}}{6}$

(C) $\frac{-3+\sqrt{69}}{6}$ (D) $\frac{-3-\sqrt{69}}{3}$

3. Consider the equations $5\sin^2 x + 3\sin x\cos - 3\cos^2 x = 2$ …(1), $\sin^2 x - \cos 2x = 2 - \sin 2x$ …(2).

If $\tan\alpha$, $\tan\beta$ satisfy (1) and $\cos\gamma$, $\cos\delta$ satisfy (2) then $\tan\alpha\tan\beta + \cos\gamma + \cos\delta$ can be equal to

(A) $-1$ (B) $-\frac{5}{3}+\frac{3}{\sqrt{13}}$

(C) $\frac{5}{3}-\frac{2}{\sqrt{13}}$ (D) $-\frac{5}{3}-\frac{2}{\sqrt{13}}$

4. If $\alpha, \beta, \gamma, \delta$ are the smallest positive angles in ascending order of magnitude which have their sines equal to the positive quantity $k$, then the value of $4\sin\frac{\alpha}{2}+3\sin\frac{\beta}{2}+2\sin\frac{\gamma}{2}+\sin\frac{\delta}{2}$ is equal to

(A) $2\sqrt{1-k}$ (B) $2\sqrt{1+k}$

(C) $2\sqrt{k}$ (D) None of these

5. If $5a + 5b + 20c = t$, then the value of $t$ for which the line $ax + by + c - 1 = 0$ always passes through a fixed point is

(A) 0 (B) 20

(C) 30 (D) None of these

6. If $a^2 + b^2 - c^2 - 2ab = 0$, then the point of concurrency of family of straight lines $ax + by + c = 0$ lies on the line

(A) $y = x$ (B) $y = x + 1$

(C) $y = -x$ (D) $x + y = 1$

7. Let $ABCD$ be a parallelogram the equation of whose diagonals are $AC: x + 2y = 3$; $BD: 2x + y = 3$. If length of diagonal $AC = 4$ units and area of $ABCD = 8$ sq. units. The length of other diagonal $BD$ is

(A) $\frac{10}{3}$ (B) 2

(C) $\frac{20}{3}$ (D) 5

8. Let $ABCD$ be a parallelogram the equation of whose diagonals are $AC: x+2y=3$; $BD: 2x+y=3$. If length of diagonal $AC = 4$ units and area of $ABCD = 8$ sq. units. The length of side $AB$ is equal to

(A) $\frac{2\sqrt{58}}{3}$ (B) $\frac{2\sqrt{58}}{9}$

(C) $\frac{3\sqrt{58}}{9}$ (D) $\frac{4\sqrt{58}}{9}$

9. Locus of the centre of circle touching to the $x$-axis & the circle $x^2 + (y-1)^2 = 1$ externally is-

(A) $\{(0, y) ; y \geq 0\} \cup (x^2 = -4y)$ (B) $\{(0, y) ; y \leq 0\} \cup (x^2 = y)$

(C) $\{(x, y) ; y \leq y\} \cup (x^2 = 4y)$ (D) $\{(0, y) ; y \geq 0\} \cup \{x^2 + (y-1)^2 = 4\}$

**Paragraph for Question Nos. 10 & 11**

10. A tangent $PT$ is drawn to the circle $x^2 + y^2 = 4$ at the point $P(\sqrt{3}, 1)$. A straight line $L$, perpendicular to $PT$ is a tangent to the circle $(x-3)^2 + y^2 = 1$.

A possible equation of L is

(A) $x - \sqrt{3}y = 1$ (B) $x + \sqrt{3}y = 1$

(C) $x - \sqrt{3}y = -1$ (D) $x + \sqrt{3}y = 5$

11. A tangent $PT$ is drawn to the circle $x^2 + y^2 = 4$ at the point $P(\sqrt{3}, 1)$. A straight line $L$, perpendicular to $PT$ is a tangent to the circle $(x-3)^2 + y^2 = 1$.

A common tangent of the two circles is

(A) $x = 4$ (B) $y = 2$

(C) $x + \sqrt{3}y = 4$ (D) $x + 2\sqrt{2}y = 6$

## Multiple Choice Questions

12. Let $0 < p < q$ and $a \neq 0$ such that the equation $px^2 + 4\lambda xy + qy^2 + 4a(x+y+1) = 0$ represents a pair of straight lines, then $a$ can lie in the interval

(A) $(-\infty, \infty)$ (B) $(-\infty, p]$

(C) $[p, q]$ (D) $[p, \infty)$

13. If the points $\left(\frac{a^3}{a-1}, \frac{a^2-3}{a-1}\right), \left(\frac{b^3}{b-1}, \frac{b^2-3}{b-1}\right)$ and $\left(\frac{c^3}{c-1}, \frac{c^2-3}{c-1}\right)$, where $a, b, c$ are different from $1$, lie on the line $lx + my + n = 0$, then

(A) $a+b+c = -\frac{m}{l}$ (B) $ab+bc+ca = \frac{n}{l}$

(C) $abc = \frac{m+n}{l}$ (D) $abc - (bc+ca+ab) + 3(a+b+c) = 0$

14. Equations of a circle which touches the axes and $x/a + y/b = 1$, centre being in positive quadrant is $x^2 + y^2 - 2rx - 2ry + r^2 = 0$, where $r =$

(A) $\frac{a+b+\sqrt{a^2+b^2}}{2}$ (B) $\frac{a+b-\sqrt{a^2+b^2}}{2}$

(C) $\frac{ab}{a+b-\sqrt{a^2+b^2}}$ (D) $\frac{ab}{a+b+\sqrt{a^2+b^2}}$

15. Let, $f_n(\theta) = \tan\frac{\theta}{2}(1+\sec\theta)(1+\sec 2\theta)(1+\sec 4\theta).....(1+\sec 2^n\theta)$ then

(A) $f_2\left(\frac{\pi}{16}\right) = 1$ (B) $f_3\left(\frac{\pi}{32}\right) = 1$

(C) $f_4\left(\frac{\pi}{64}\right) = 1$ (D) $f_5\left(\frac{\pi}{128}\right) = 1$

## Matrix

| 16. Column-1 | Column-2 |
|---|---|
| (1) The values of $\cos^2\theta + \sin^4\theta$ for all $\theta$ | (P) belong to (0, 1] |
| (2) In a $\Delta ABC$ if $\tan A < 0$ then values of $\tan B \tan C$ | (Q) belong to $\left[\frac{3}{4}, 1\right]$ |
| (3) For any real $\theta \neq n\pi,\ n \in I$ then values of $\frac{\cos^2\theta - 1}{\cos^2\theta + \cos\theta}$ | (R) are less than 0 or greater than 2 |
| (4) If $A > 0$, $B > 0$ and $A + B = \frac{\pi}{3}$ then the values of $3\tan A \tan B$ | (S) belong to (0, 1) |

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

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

## INTEGER

17. If $a\tan\alpha + \sqrt{a^2-1}\tan\beta + \sqrt{a^2+1}\tan\gamma = 2a$, where $a$ is constant and $\alpha, \beta, \gamma$ are variable angles. Then the least value of $3(\tan^2\alpha + \tan^2\beta + \tan^2\gamma)$ is equal to

18. If $\cos\alpha = \frac{2\cos\beta - 1}{2 - \cos\beta}$ $(0 < \alpha < \beta < \pi)$, then find the value of $\sqrt{3}\left(\frac{\tan\frac{\alpha}{2}}{\tan\frac{\beta}{2}}\right)$.

19. If $(\sin\theta, \cos\theta)$, $\theta \in [0, 2\pi]$ and (1, 4) lie on the same side or on the line $\sqrt{3}x - y + 1 = 0$, then the maximum value of $\sin\theta$ will be

20. If the lines $x = a + m$, $y = -2$ and $y = mx$ are concurrent, if the least value of $|a|$ is $l\sqrt{k}$, then $lk =$

21. If the sum of the squares of the lengths of the chords intercepted by the line $x + y = n$, $n \in \mathbf{N}$ on the circle $x^2 + y^2 = 4$ is $11k$, then $k =$

**ANSWER KEY**

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

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