TRI

LEVEL-I

1. If $\sin\theta + \text{cosec}\theta = 2$, then the value of $\sin^n\theta + \text{cosec}^n\theta$, $n \geq 2$, $n \in N$ equals
   (A) 2 (B) 2^n
   (C) 1 (D) none of these

2. The maximum value of $1 + \sin\left(\frac{\pi}{4}+\theta\right) + 2\cos\left(\frac{\pi}{4}-\theta\right)$, $\theta \in R$, equals
   (A) 3 (B) 5
   (C) 4 (D) none of these

3. The least value of $\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2$ is
   (A) $4 + \sqrt{10}$ (B) $4 - \sqrt{10}$
   (C) 0 (D) none of these

4. If $0 < \beta < \alpha \leq \frac{\pi}{4}$, $\cos(\alpha + \beta) = \frac{3}{5}$ and $\cos(\alpha - \beta) = \frac{4}{5}$, then $\sin 2\alpha$ is equals
   (A) 1 (B) 0
   (C) 2 (D) none of these

5. The numerical value of $\sin\frac{\pi}{18}.\sin\frac{5\pi}{18}.\sin\frac{7\pi}{18}$ is equal to
   (A) 1 (B) $\frac{1}{8}$
   (C) $\frac{1}{4}$ (D) none of these

6. If $\tan\theta.\tan\left(\frac{\pi}{3}+\theta\right).\tan\left(\frac{\pi}{3}-\theta\right) = -1$, $(0 < \theta < \pi/2)$, then value of $3\sin\theta - 4\cos^3\theta =$
   (A) 1 (B) -1
   (C) $1/\sqrt{2}$ (D) $-1/\sqrt{2}$

7. If in a ΔABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is
   (A) isosceles triangle (B) right angled triangle (C) acute angle triangle
   (D) obtuse angled triangle

8. Minimum value of the expression $2\sin x + 4\cos x + 3\sqrt{5}$ is
   (A) $5\sqrt{5}$ (B) $2\sqrt{5} + 3$ (C) $2\sqrt{5} - 3$ (D) none of these

9. The maximum value of $4\sin^2 x + 3\cos^2 x + \sin x/2 + \cos x/2$ is
   (A) $4 + \sqrt{2}$ (B) $3 + \sqrt{2}$ (C) 9 (D) 4

10. If $\tan\theta = \frac{1}{2}$, $\tan\phi = \frac{1}{3}$, then $\theta + \phi =$ _____
    (A) 0 (B) $\pi/2$
    (C) $\pi/4$ (D) π

11. The value of $\tan 15^0$ = _____

12. If $2 \sin\theta \cdot \sec 3\theta = \tan 3\theta - \tan\theta$, then $2[\sin\theta \cdot \sec 3\theta + \sin 3\theta \cdot \sec 3^2\theta + \ldots.. + \sin 3^{n-1}\theta \cdot \sec 3^n\theta]$ = _____

13. If $\tan\theta = \frac{b}{a}$, then $a\cos 2\theta + b \sin 2\theta$ =_____

14. Maximum value of $2\cos\theta + 3\sin\theta + 4$ is _____

15. If $\sec\theta - \tan\theta = 5$, then $\sec\theta$ = _____

16. If $\pi < 2\theta < \frac{3\pi}{2}$, then $\sqrt{2+\sqrt{2+2\cos 4\theta}}$ equals to
(A) $-2\cos\theta$ (B) $-2\sin\theta$ (C) $2\cos\theta$ (D) $2\sin\theta$

17. If $\tan\theta = \sqrt{n}$ for some non-square natural number n then $\sec 2\theta$ is
(A) a rational number (B) an irrational number
(C) a positive number (D) none of these.

18. If α and β are two distinct roots of the equation $a\tan x + b\sec x = c$, then $\tan(\alpha + \beta)$ is equal to
(A) $\frac{a^2 - c^2}{a^2 + c^2}$ (B) $\frac{a^2 + c^2}{a^2 - c^2}$ (C) $\frac{2ac}{a^2 + c^2}$ (D) $\frac{2ac}{a^2 - c^2}$

19. If $\sin\theta = 3\sin(\theta + 2\alpha)$ then value of $\tan(\theta + \alpha) + 2\tan\alpha$ is
(A) 3 (B) 2 (C) 1 (D) 0

20 In a ΔABC, if $\cot A \cot B \cot C > 0$, then the Δ is
(A) acute angled (B) right angled
(C) obtuse angled (D) does not exist

21 If $\sin x = \cos^2 x$, then $\cos^2 x (1 + \cos^2 x)$ equals to
(A) 0 (B) 1
(C) 2 (D) none of these

22 The value of $\sin 15^0$ = _____

23 Maximum value of $2\cos\theta + 3\sin\theta + 5$ = _____

24 If $\sin\alpha \sin\beta - \cos\alpha \cos\beta = 1$, then $\tan\alpha + \tan\beta$ = _____

25 If $\tan\theta = \frac{x}{y}$, then $x\cos 2\theta + y \sin 2\theta$ = _____

26 The value of $\cos 10^0 - \sin 10^0$ is
(A) positive (B) negative
(C) 0 (D) 1

27 $\frac{\tan 69^0 + \tan 66^0}{1 - \tan 69^0 \tan 66^0}$ =

(A) 1 (B) –1
(C) 0 (D) none of these

28. The value of $\sin 12^0 \sin 28^0 \sin 54^0$ = _____

29. If $\sin\alpha \sin\beta - \cos\alpha \cos\beta + 1 = 0$, then $1 + \cot\alpha \tan\beta$ = _____

30. The equation $\sin^2\theta = \frac{x^2 + y^2}{2xy}$ is possible if

(A) x = y (B) x = -y
(C) 2x = y (D) none of these

31. $\sqrt{3}$ sin x + cos x is maximum when x is

(A) 30^0 (B) 45^0
(C) 60^0 (D) 90^0

32. The minimum value of $3\tan^2\theta + 12 \cot^2\theta$ is

(A) 6 (B) 15
(C) 24 (D) none of these .

33. If $\frac{\tan 3\theta}{\tan\theta} = 4$, then $\frac{\sin 3\theta}{\sin\theta}$ equals

(A) 3/5 (B) 4/5
(C) 3/4 (D) none of these.

34. For any real θ, the maximum value of $\cos^2(\cos\theta) + \sin^2(\sin\theta)$

(A) is 1 (B) is $1 + \sin^2 1$
(C) is $1 + \cos^2 1$ (D) does not exist

35. If cosecA + cotA = 11/2, then tanA is equal to

(A) 111/44 (B) 44/117
(C) 44/125 (D) 117/125

36. If in ΔABC, $\angle A = \sin^{-1}(x)$, $\angle B = \sin^{-1}(y)$ and $\angle C = \sin^{-1}(z)$, then $x\sqrt{1-y^2}\sqrt{1-z^2} + y\sqrt{1-x^2}\sqrt{1-z^2} + z\sqrt{1-x^2}\sqrt{1-y^2}$ is equal to

(A) xyz (B) x+y+z
(C) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ (D) None of these

37. If $T_n = \sin^n\theta + \cos^n\theta$, then $\frac{T_6 - T_4}{T_6} = m$ holds for values of m satisfying

(A) $m \in \left[-1, \frac{1}{3}\right]$ (B) $m \in \left[0, \frac{1}{3}\right]$
(C) $m \in [-1, 0]$ (D) None of these

38. If 4 sinA + secA =0 then tanA equals to

(A) $4 \pm \sqrt{2}$ (B) $-2 \pm \sqrt{3}$
(C) $2 \pm 4\sqrt{3}$ (D) $4 \pm 2\sqrt{3}$

39. Value of the expression $2\sin x - \cos 2x$ is always
(A) greater than or equal to -3/2 (B) less than or equal to 3/2
(C) greater than or equal to -1/2 (D) none of these

40. If $\cos 25° + \sin 25° = k$, then $\cos 20°$ is equal to
(A) $\frac{k}{\sqrt{2}}$ (B) $-\frac{k}{\sqrt{2}}$
(C) $\pm\frac{k}{\sqrt{2}}$ (D) None of these

41. If $2n\alpha = \pi/2$, then $\tan\alpha \tan 2\alpha \tan 3\alpha \ldots \tan(2n-1)\alpha$ is equal to
(A) 1 (B) – 1
(C) 0 (D) None of these

42. If $-2 < \cos\theta + \sec\theta \le 2$, then $\cos^n\theta + \sec^n\theta$ is equal to $(n \in N)$
(A) 2 (B) 2^n
(C) 0 (D) None of these.

43. If $\tan\theta = n \tan\phi$, then maximum value of $\tan^2(\theta - \phi)$ is equal to
(A) $\frac{(n-1)^2}{4n}$ (B) $\frac{(n+1)^2}{4n}$
(C) $\frac{(n+1)}{2n}$ (D) $\frac{(n-1)}{2n}$

44. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$; Then the value of $\cos\theta + \sin\theta$ is equal to;
(A) $\sqrt{2}\cos\theta$ (B) $-\sqrt{2}\cos\theta$
(C) $-\sqrt{2}\cos\theta$ (D) none of these

45. If $\sec^2\theta = \frac{4xy}{(x+y)^2}$, then x and y ;
(A) are always equal (B) can be any real number
(C) can assume finite number (D) none of these.

46. If $\cos x + \sec x = -2$, then for a positive integer n, $\cos^n x + \sec^n x$ is
(A) always 2 (B) always –2
(C) 2, if n is odd (D) 2, if n is even

47. If $|\sin x + \cos x| = |\sin x| + |\cos x|$, then x belongs to the quadrant
(A) I or III (B) II or IV
(C) I or II (D) III or IV

48. $\sin x + \cos x = y^2 - y + a$ has no value of x for any y if 'a' belongs to
(A) $(0, \sqrt{3})$ (B) $(-\sqrt{3}, 0)$
(C) $(-\infty, -\sqrt{3})$ (D) $(\sqrt{3}, \infty)$

49. If $\tan A + \cot A = 4$, then $\tan^4 A + \cot^4 A$ is equal to
(A) 110 (B) 191
(C) 80 (D) 194

50. $\cos^2\frac{\pi}{12} + \cos^2\frac{\pi}{4} + \cos^2\frac{5\pi}{12}$ is

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

(C) $\frac{3+\sqrt{3}}{2}$ (D) $\frac{3}{2}$

51. If A lies in the second quadrant and 3 tanA + 4 = 0 then the value of 2 cotA – 5 cosA + sinA is equal to

(A) $\frac{37}{10}$ (B) $\frac{23}{10}$

(C) - $\frac{53}{10}$ (D) none of these

52. The minimum value of $\sec^2\theta + \cos^2\theta$ is

(A) 1 (B) 0

(C) 2 (D) none of these

53. If $\sin\alpha = p$ then the equation whose solution is $\tan\frac{\alpha}{2}$ is

(A) $px^2 + 2xp - 1 = 0$ (B) $px^2 + 2x - p = 0$

(B) $x^2 + 2x - p = 0$ (D) None of these

LEVEL-II

1. $\sin^2\theta = \frac{(x+y)^2}{4xy}$, where $x, y \in R$, gives real θ if and only if

(A) x + y = 0 (B) x = y

(C) $|x| = |y| \neq 0$ (D) none of these

2. Let a = cosA + cosB – cos(A + B) and $b = 4\sin\frac{A}{2}.\sin\frac{B}{2}.\cos\frac{A+B}{2}$. Then a – b is equal to

(A) 1 (B) 0

(C) – 1 (D) none of these

3. If $3\sin\theta + 4\cos\theta = 5$, then $4\sin\theta - 3\cos\theta$ is equal to

(A) 0 (B) 5

(C) 1 (D) none of these

4. If in ΔABC $\angle C = 90^0$, then the maximum value of sin A sin B is

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

5. If θ lies in fourth quadrant, then $\sqrt{4\cos^4\theta + \sin^2 2\theta} + 4\cos^2\left(\frac{\pi}{2}+\frac{\theta}{2}\right)$ is equal to

(A) 1 (B) 2 (C) –2 (D) 0

6. If $(\alpha + \beta + \gamma + \delta) = \pi$ then $\sum\cos\alpha\cos\beta - \sum\sin\alpha\sin\beta =$

(A) 4 (B) 2 (C) 0 (D) none of these

7. If $x + y = 2\alpha$ then minimum value of sec x + sec y is, $x, y \in \left(0, \frac{\pi}{2}\right)$

(A) $2\cos\alpha$ (B) $\cos 2\alpha$ (C) $2\sec\alpha$ (D) none of these

8. $\frac{\tan 70^0 - \tan 20^0}{4\tan 50^0}$ =

(A) 1 (B) 1/2 (C) –1 (D) –1/2

9. In a triangle ABC maximum value of sin A + sin B + sin C is

(A) $\frac{3\sqrt{3}}{2}$ (B) $\frac{2\sqrt{3}}{2}$ (C) $3\sqrt{3}$ (D) $\frac{\sqrt{3}}{2}$

10. If $1 + \sin\theta + \sin^2\theta + \sin^3\theta + \ldots$.to $\infty = 4 + 2\sqrt{3}$, $0 < \theta < \pi$, $\theta \neq \pi/2$ then

(A) $\theta = \frac{\pi}{6}$ (B) $\theta = \frac{\pi}{3}$ (C) $\theta = \frac{\pi}{6}$ or $\frac{\pi}{3}$ (D) $\theta = \frac{\pi}{3}$ or $\frac{2\pi}{3}$

11. The value of $\tan 1^0 \tan 2^0 \tan 3^0 \ldots\ldots\ldots \tan 89^0$_____

12. Value of $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{3\pi}{9}\sin\frac{4\pi}{9}$ is _____ __

13. If $\sin x + \sin^2 x = 1$, then $\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x - 1$ = _____

14. If $\sin(\alpha + \beta) = 1$, $\sin(\alpha - \beta) = \frac{1}{2}$ where $\alpha, \beta \in \left[0, \frac{\pi}{2}\right]$, then $\tan(\alpha + 2\beta)\tan(2\alpha + \beta)$ is_____

15. If in a ΔABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is

(A) isosceles triangle (B) right angled triangle
(C) acute angle triangle (D) obtuse angled triangle

16. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$ then

(A) $\sin\theta\cos\theta = 1/x$ (B) $\sin\theta\tan\theta = y$ (C) $\left(x^2y\right)^{2/3} - \left(xy^2\right)^{2/3} = 1$ (D) $\left(x^2y\right)^{2/3} + \left(xy^2\right)^{2/3} = 1$

17. The minimum value of cos(cosx) is

(A) 0 (B) –cos1
(C) cos1 (D) –1

18. If $\sin\alpha$, $\sin\beta$ and $\cos\alpha$ are in G.P, then roots of the equation $x^2 + 2x\cot\beta + 1 = 0$ are always.

(A) equal (B) real
(C) imaginary (D) greater than 1

19. If $A + B = 45^0$, then $(1 + \tan A)(1 + \tan B)$ = _____

20. If $\sin\theta$, $\cos\theta$, $\tan\theta$ are in G.P, then $\cot^6\theta - \cot^2\theta$ is

(A) 1 (B) –1
(C) 0 (D) 2

21. If $\sin x + \sin^2 x = 1$, then $\cos^8 x + 2\cos^6 x + \cos^4 x$ is

(A) 0 (B) –1
(C) 2 (D) 1

22. If $\tan\beta = \frac{2\sin\alpha\sin\gamma}{\sin(\alpha+\gamma)}$ then $\cot\alpha$, $\cot\beta$, $\cot\gamma$ are in
(A) AP (B) GP
(C) HP (D) none of these

23. If $\tan^2\theta = 2\tan^2\phi + 1$, then $\cos 2\theta + \sin^2\phi =$
(A) 1 (B) 2
(C) 0 (D) –1

24. The value of expression $\sqrt{3}$ cosec 20^0 –sec 20^0 is equal to
(A) 2 (B) 4
(C) $\frac{2\sin 20^0}{\sin 40^0}$ (D) $\frac{4\sin 20^0}{\sin 40^0}$

25. If sinx + cosx + tanx + cot x + secx + cosecx = 7 and $\sin 2x = a - b\sqrt{7}$, then ordered pair (a, b) can be,
(A) (6, 2) (B) (8, 3)
(C) (22, 8) (D) (11, 4)

26. If $\tan x - \tan^2 x = 1$, then the value of $\tan^4 x - 2\tan^3 x - \tan^2 x + 2\tan x + 1$ is
(A) 1 (B) 2
(C) 3 (D) 4

27. The minimum value of the expression $3^{\sin^6 x} + 3^{\cos^6 x}$ is
(A) $2.3^{1/8}$ (B) $2.3^{7/8}$
(C) $3.2^{1/8}$ (D) None of these

28. If $\sin\theta + \sin\phi = \sqrt{3}(\cos\phi - \cos\theta)$, then $\sin 3\theta + \sin 3\phi$ is equal to
(A) $\sqrt{3}$ (B) 0
(C) 1 (D) None of these

29. The minimum value of $(a\sec\theta - b\tan\theta)^2$, $|a| < |b|$, is
(A) 0 (B) $a^2 + b^2$
(C) ab (D) (1/2) $(a^2 + b^2)$

30. If $\tan x + \tan^2 x + \tan^3 x = 1$ then the value of $2\cos^6 x - 2\cos^4 x + \cos^2 x$ equals to
(A) 1/2 (B) 2
(C) 1 (D) none of these

31. If $a \le 16\sin x\cos x + 12\cos^2 x - 6 \le b$ for all $x \in R$ then
(A) a = -5, b = 5 (B) a = -4, b = 4
(C) a = -10, b =10 (D) none of these

32. If $k\sin^2 x + \frac{1}{k}\text{cosec}^2 x = 2$, $x \in (0, \pi/2)$, then $\cos^2 x + 5\sin x\cos x + 6\sin^2 x$ is equal to
(A) $\frac{k^2 + 5k + 6}{k^2}$ (B) $\frac{k^2 - 5k + 6}{k^2}$
(C) 6 (D) none of these

33. Value of $\sin^4\frac{\pi}{8}+\sin^4\frac{3\pi}{8}+\sin^4\frac{5\pi}{8}+\sin^4\frac{7\pi}{8}$ is equal to;

(A) 3/2 (B) 2/3

(C) $\sqrt{3/2}$ (D) $\sqrt{2/3}$

34. The minimum value of $\frac{1}{-2\sin x-2\sqrt{3}\cos x+6}$ is equal to

(A) $-\frac{1}{10}$ (B) $-\frac{1}{\sqrt{3}}$

(C) $\frac{1}{10}$ (D) $\frac{1}{6}$

LEVEL-III

1. In a ΔABC, $\cos2A + 4\cos(B + C)\sin B \sin C$ is equal to

(A) $2\cos^2A + \cos2B$ (B) $\cos2B - 2\sin^2A$

(C) $\cos^2B + 2\cos A$ (D) none of these

2. The value of $\cot^2 36^\circ \cot^2 72^\circ$ is

(A) 1/2 (B) 1/3

(C) 1/4 (D) 1/5

3. If $x = \alpha, \beta$ satisfy both the equations $a\cos^2x + b\cos x + 1 = 0$ and $a\sin^2x + p\sin x + 1 = 0$, then

(A) $2a(a+2) = b^2 - p^2$ (B) $2a(a-2) = b^2 + p^2$

(C) $2a(a+2) = b^2 + p^2$ (D) None of these

4. The number of points inside or on the circle $x^2 + y^2 = 4$ satisfying $\tan^4x + \cot^4x + 1 = 3\sin^2y$ is

(A) one (B) two

(C) four (D) infinite

5. The number of ordered 4-tuple (x, y, z, w) (x, y, z, w $\in$ [0, 10]) which satisfied the inequality, $2^{\sin^2 x}3^{\cos^2 y}4^{\sin^2 z}5^{\cos^2 w} \geq 120$ is

(A) 0 (B) 144

(C) 81 (D) infinite

6. If all the solutions 'x' of $a^{\cos x} + a^{-\cos x} = 6$ $(a > 1)$ are real, then set of values of a is

(A) $[3+2\sqrt{2}, \infty)$ (B) (6, 12)

(C) $(1, 3 + 2\sqrt{2})$ (D) none of these.

7. A quadrilateral ABCD is circumscribed about a circle, then

(A) $AB.\sin\frac{A}{2}.\sin\frac{B}{2} = CD\ \sin\frac{C}{2}\sin\frac{D}{2}$ (B) $AB.\sin\frac{C}{2}\sin\frac{A}{2}. = CD\sin\frac{B}{2}\sin\frac{D}{2}$

(C) $AB.\sin\frac{A}{2}.\sin\frac{D}{2} = CD\sin\frac{B}{2}\sin\frac{C}{2}$ (C) None of these .

ANSWERS

LEVEL −I

1.	A	2.	C	3.	B	4.	A
5.	B	6.	C	7.		8.	D
9.	A	10.	C	11.	$2-\sqrt{3}$	12.	$\tan 3^n\theta$ - $\tan\theta$
13.	A	14.	$\sqrt{13}+4$	15.	$\frac{13}{5}$	16.	A
17.	A	18.	D	19.	D	20.	A
21.	D	22.	$\sqrt{3}-1$				
23.	$\sqrt{13}+5$	24.	0				
25.	$\frac{x\left(3y^2-x^2\right)}{x^2+y^2}$	26.	A				
27.	B	28.	$\frac{\sin 18^0}{4}$				
29.	0	30.	A	31.	C	32.	D
33.	D	34.	B	35.	B	36.	A
37.	C	38.	B	39.	A	40.	A
41.	A	42.	A	43.	A	44.	A
45.	A	46.	D	47.	A	48.	D
49.	D	50.	D	51.	B		
52.	C	53.	D				

LEVEL −II

1.	C	2.	A	3.	B	4.	A
5.	B	6.	C	7.	C	8.	B
9.	A	10.	D	11.	1	12.	$\frac{3}{16}$
13.	0	14.	1	15.	B	16.	C
17.	C	18.	B	19.	2	20.	A
21.	D	22.	A	23.	C	24.	B
25.	C	26.	D	27.	A	28.	B
29.	A	30.	A	31.	C	32.	D
33.	A	34.	C				

LEVEL −III

1.	D	2.	D	3.	C	4.	C
5.	B	6.	A	7.	A		