EXERCISE-I

Maximum & minimum values of trigonometrical functions, conditional trigonometrical identities

1. If $x+y+z=180^o$,
then $\cos 2x+\cos 2y-\cos 2z$ is equal to
(A) $4\sin x.\sin y.\sin z$
(B) $1-4\sin x.\sin y.\cos z$
(C) $3\cos\theta-4\sin\theta$
(D) $\cos A.\cos B.\cos C$

2. If $\alpha+\beta+\gamma=2\pi$, then
(A) $\tan\frac{\alpha}{2}+\tan\frac{\beta}{2}+\tan\frac{\gamma}{2}=\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2}$
(B) $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}+\tan\frac{\beta}{2}\tan\frac{\gamma}{2}+\tan\frac{\gamma}{2}\tan\frac{\alpha}{2}=1$
(C) $\tan\frac{\alpha}{2}+\tan\frac{\beta}{2}+\tan\frac{\gamma}{2}=-\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2}$
(D) None of these

3. If $A+B+C=\pi$,
then $\cos 2A+\cos 2B+\cos 2C=$
(A) $1+4\cos A\cos B\sin C$
(B) $-1+4\sin A\sin B\cos C$
(C) $-1-4\cos A\cos B\cos C$
(D) None of these

4. If $A+B+C=180^o$,
then $\frac{\sin 2A+\sin 2B+\sin 2C}{\cos A+\cos B+\cos C-1}=$
(A) $8\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$ (B) $8\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$
(C) $8\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$ (D) $8\cos\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

5. A, B, C are the angles of a triangle, then $\sin^2 A+\sin^2 B+\sin^2 C-2\cos A\cos B\cos C=$
(A) 1 (B) 2
(C) 3 (D) 4

6. If $\cos A=\cos B\cos C$ and $A+B+C=\pi$, then the value of $\cot B\cot C$ is
(A) 1 (B) 2
(C) $\frac{1}{3}$ (D) $\frac{1}{2}$

7. If $A+B+C=180^o$, then the value of $(\cot B+\cot C)\ (\cot C+\cot A)\ (\cot A+\cot B)$ will be
(A) $\sec A\sec B\sec C$
(B) $\operatorname{cosec} A\operatorname{cosec} B\operatorname{cosec} C$
(C) $\tan A\tan B\tan C$
(D) 1

8. If $A+B+C=180^o$, then the value of $\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}$ will be
(A) $2\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$ (B) $4\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$
(C) $\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$ (D) $8\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$

9. If $A+B+C=270^o$, then
$\cos 2A+\cos 2B+\cos 2C+4\sin A\sin B\sin C=$
(A) 0 (B) 1
(C) 2 (D) 3

10. If $A+B+C=180^o$, then $\sum\tan\frac{A}{2}\tan\frac{B}{2}=$
(A) 0 (B) 1
(C) 2 (D) 3

11. If $A+B+C=\pi\ (A,B,C>0)$ and the angle C is obtuse then
(A) $\tan A\tan B>1$ (B) $\tan A\tan B<1$
(C) $\tan A\tan B=1$ (D) None of these

12. If A, B, C are acute positive angles such that $A+B+C=\pi$ and $\cot A\cot B\cot C=K$, then
(A) $K\le\frac{1}{3\sqrt{3}}$ (B) $K\ge\frac{1}{3\sqrt{3}}$
(C) $K<\frac{1}{9}$ (D) $K>\frac{1}{3}$

General Solution of Standard Trigonometrical Equations

13. If $\tan 2\theta \tan\theta = 1$, then the general value of θ is

(A) $\left(n+\frac{1}{2}\right)\frac{\pi}{3}$ (B) $\left(n+\frac{1}{2}\right)\pi$

(C) $\left(2n\pm\frac{1}{2}\right)\frac{\pi}{3}$ (D) None of these

14. If $1+\cot\theta = \text{cosec}\,\theta$, then the general value of θ is

(A) $n\pi+\frac{\pi}{2}$ (B) $2n\pi-\frac{\pi}{2}$

(C) $2n\pi+\frac{\pi}{2}$ (D) None of these

15. If $\cos 7\theta = \cos\theta - \sin 4\theta$, then the general value of θ is

(A) $\frac{n\pi}{4}, \frac{n\pi}{3}+\frac{\pi}{18}$ (B) $\frac{n\pi}{3}, \frac{n\pi}{3}+(-1)^n\frac{\pi}{18}$

(C) $\frac{n\pi}{4}, \frac{n\pi}{3}+(-1)^n\frac{\pi}{18}$ (D) $\frac{n\pi}{6}, \frac{n\pi}{3}+(-1)^n\frac{\pi}{18}$

16. If $\frac{1-\tan^2\theta}{\sec^2\theta} = \frac{1}{2}$, then the general value of θ is

(A) $n\pi\pm\frac{\pi}{6}$ (B) $n\pi+\frac{\pi}{6}$

(C) $2n\pi\pm\frac{\pi}{6}$ (D) None of these

17. If $\cos\theta+\sec\theta = \frac{5}{2}$, then the general value of θ is

(A) $n\pi\pm\frac{\pi}{3}$ (B) $2n\pi\pm\frac{\pi}{6}$

(C) $n\pi\pm\frac{\pi}{6}$ (D) $2n\pi\pm\frac{\pi}{3}$

18. If $\cot\theta+\tan\theta = 2\text{cosec}\,\theta$, the general value of θ is

(A) $n\pi\pm\frac{\pi}{3}$ (B) $n\pi\pm\frac{\pi}{6}$

(C) $2n\pi\pm\frac{\pi}{3}$ (D) $2n\pi\pm\frac{\pi}{6}$

19. The most general value of θ satisfying the equations $\sin\theta = \sin\alpha$ and $\cos\theta = \cos\alpha$ is

(A) $2n\pi+\alpha$ (B) $2n\pi-\alpha$

(C) $n\pi+\alpha$ (D) $n\pi-\alpha$

20. The solution of the equation

$$\begin{vmatrix} \cos\theta & \sin\theta & \cos\theta \\ -\sin\theta & \cos\theta & \sin\theta \\ -\cos\theta & -\sin\theta & \cos\theta \end{vmatrix} = 0, \text{ is}$$

(A) $\theta = n\pi$ (B) $\theta = 2n\pi\pm\frac{\pi}{2}$

(C) $\theta = n\pi\pm(-1)^n\frac{\pi}{4}$ (D) $\theta = 2n\pi\pm\frac{\pi}{4}$

21. The set of values of x for which the expression $\frac{\tan 3x-\tan 2x}{1+\tan 3x\tan 2x} = 1$, is

(A) φ

(B) $\frac{\pi}{4}$

(C) $\left\{n\pi+\frac{\pi}{4} : n = 1,2,3.....\right\}$

(D) $\left\{2n\pi+\frac{\pi}{4} : n = 1,2,3.....\right\}$

22. If $\tan\theta+\tan 2\theta+\sqrt{3}\tan\theta\tan 2\theta = \sqrt{3}$, then

(A) $\theta = (6n+1)\pi/18, \forall n\in I$

(B) $\theta = (6n+1)\pi/9, \forall n\in I$

(C) $\theta = (3n+1)\pi/9, \forall n\in I$

(D) None of these

General Solution of Square of Trigonometric Equations

23. If $\frac{1-\cos 2\theta}{1+\cos 2\theta} = 3$, then the general value of θ is

(A) $2n\pi\pm\frac{\pi}{6}$ (B) $n\pi\pm\frac{\pi}{6}$

(C) $2n\pi \pm \frac{\pi}{3}$ (D) $n\pi \pm \frac{\pi}{3}$

24. If $\tan^2\theta - (1+\sqrt{3})\tan\theta + \sqrt{3} = 0$, then the general value of θ is

(A) $n\pi + \frac{\pi}{4}, n\pi + \frac{\pi}{3}$ (B) $n\pi - \frac{\pi}{4}, n\pi + \frac{\pi}{3}$

(C) $n\pi + \frac{\pi}{4}, n\pi - \frac{\pi}{3}$ (D) $n\pi - \frac{\pi}{4}, n\pi - \frac{\pi}{3}$

25. If $4\sin^4 x + \cos^4 x = 1$, then $x =$

(A) $n\pi$ (B) $n\pi \pm \sin^{-1}\frac{2}{5}$

(C) $n\pi + \frac{\pi}{6}$ (D) None of these

26. If $\cos 3x + \sin\left(2x - \frac{7\pi}{6}\right) = -2$,

then $x =$ (where $k \in Z$)

(A) $\frac{\pi}{3}(6k+1)$ (B) $\frac{\pi}{3}(4k+1)$

(C) $\frac{\pi}{3}(2k+1)$ (D) None of these

27. $2\sin^2 x + \sin^2 2x = 2, -\pi < x < \pi$, then $x =$

(A) $\pm\frac{\pi}{6}$ (B) $\pm\frac{\pi}{4}$

(C) $\frac{3\pi}{2}$ (D) None of these

28. The values of θ satisfying

$\sin 7\theta = \sin 4\theta - \sin\theta$ and $0 < \theta < \frac{\pi}{2}$ are

(A) $\frac{\pi}{9}, \frac{\pi}{4}$ (B) $\frac{\pi}{3}, \frac{\pi}{9}$

(C) $\frac{\pi}{6}, \frac{\pi}{9}$ (D) $\frac{\pi}{3}, \frac{\pi}{4}$

29. The expression $(1+\tan x+\tan^2 x)(1-\cot x+\cot^2 x)$ has the positive values for x, given by

(A) $0 \le x \le \frac{\pi}{2}$ (B) $0 \le x \le \pi$

(C) For all $x \in R$ (D) $x \ge 0$

30. If $5\cos 2\theta + 2\cos^2\frac{\theta}{2} + 1 = 0, -\pi < \theta < \pi$, then $\theta =$

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{3}, \cos^{-1}\frac{3}{5}$

(C) $\cos^{-1}\frac{3}{5}$ (D) $\frac{\pi}{3}, \pi - \cos^{-1}\frac{3}{5}$

31. If $\cos\theta = \frac{-1}{2}$ and $0^o < \theta < 360^o$, then the values of θ are

(A) 120^o and 300^o (B) 60^o and 120^o

(C) 120^o and 240^o (D) 60^o and 240^o

General Solution of Trigonometric Equation $a\cos\theta + b\sin\theta = c$

32. The equation a sin x + b cos x = c, where |c| > $\sqrt{a^2+b^2}$ has-

(A) A unique solution

(B) Infinite no. of solutions

(C) No solution

(D) None of these

33. General solution of $\sin^3 x + \cos^3 x + \frac{3}{2}\sin 2x = 1$

(A) x = nπ when n is even integer

(B) x = nπ + when n is odd integer

(C) x = 2nπ when n is odd integer

(D) x = nπ – when n is even integer

34. The smallest angle of the triangle whose sides are is $6+\sqrt{12}, \sqrt{48}, \sqrt{24}$

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

35. In a ΔABC, 2s = perimeter and R circumradius. Then s/R is equal to-

(A) sin A + sin B + sin C

(B) cos A + cos B + cos C

(C) $\sin\frac{A}{2}+\sin\frac{B}{2}+\sin\frac{C}{2}$

(D) none of these

36. If R denotes circumradius then in a ΔABC, $\frac{b^2-c^2}{2aR}$ is equal to-

(A) cos (B – C) (B) sin(B – C) (C) cos B – cos C (D) none of these

37. The ratio of the circumradius and inradius of an equilateral triangle is-

(A) 3 : 1 (B) 1 : 2

(C) 2 : $\sqrt{3}$ (D) 2 : 1

38. In and equilateral triangle, the in radius, circum-radius and one of the ex-radii are in the ratio-

(A) 2 : 3 : 5 (B) 1 : 2 : 3

(C) 3 : 7 : 9 (D) 3 : 7 : 9

39. If the exradii of a triangle are in HP the corresponding sides are in-

(A) A.P. (B) G.P.

(C) H.P. (D) none of these

40. In triangle ABC, if $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos C}{c}$ and a = 2, then area of this triangle is-

(A) 1 (B) 2

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

41. In triangle ABC, if b = 3, c = 4 and $\angle B = \pi/3$, then number of such triangles is-

(A) 1 (B) 2

(C) 0 (D) infinte

42. Radius of the incircle of the triangle with side 18, 24, 30 cms is-

(A) 2 (B) 4

(C) 6 (D) 9

43. In triangle ABC, with general notions $r_1 + r_2 + r_3 - r$ is equal to

(A) 4R (B) Δ^2

(C) Δ (D) 2R

44. In triangle ABC, cos A + cos B + cos C is equal to-

(A) 1 + R/r (B) 1 + r/R

(C) 1 – R/r (D) 1 – r/R

45. In triangle ABC if a, b, c are in AP, then $\tan\frac{A}{2}, \tan\frac{B}{2}, \tan\frac{C}{2}$ will be in

(A) A.P. (B) G.P.

(C) H.P. (D) none of these