RATIO ASSIGNMENT

1. One root of the equation $\cos x - x + \frac{1}{2} = 0$ lies in the interval

(a) $\left[0, \frac{\pi}{2}\right]$ (b) $\left[-\frac{\pi}{2}, 0\right]$ (c) $\left[\frac{\pi}{2}, \pi\right]$ (d) $\left[\pi, \frac{3\pi}{2}\right]$

2. If $\frac{2\sin\alpha}{\{1+\cos\alpha+\sin\alpha\}} = y$, then $\frac{\{1-\cos\alpha+\sin\alpha\}}{1+\sin\alpha} =$

(a) $\frac{1}{y}$ (b) y (c) $1 - y$ (d) $1 + y$

3. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta =$

(a) 4 (b) 2 (c) 1 (d) None of these

4. If θ and ϕ are angles in the 1st quadrant such that $\tan\theta = 1/7$ and $\sin\phi = 1/\sqrt{10}$. Then

(a) $\theta + 2\phi = 90^o$ (b) $\theta + 2\phi = 60^o$ (c) $\theta + 2\phi = 30^o$ (d) $\theta + 2\phi = 45^o$

5. The value of θ lying between 0 and $\pi/2$ and satisfying the equation $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$

(a) $\frac{7\pi}{24}$ or $\frac{11\pi}{24}$ (b) $\frac{5\pi}{24}$ (c) $\frac{\pi}{24}$ (d) None of these

6. If $\frac{3\pi}{4} < \alpha < \pi$, then $\sqrt{cosec^2\alpha + 2\cot\alpha}$ is equal to

(a) $1 + \cot\alpha$ (b) $1 - \cot\alpha$ (c) $-1 - \cot\alpha$ (d) $-1 + \cot\alpha$

7. If for all real values of x, $\frac{4x^2+1}{64x^2 - 96x.\sin\alpha + 5} < \frac{1}{32}$, then α lies in the interval

(a) $\left(0, \frac{\pi}{3}\right)$ (b) $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$ (c) $\left(\frac{2\pi}{3}, \pi\right)$ (d) $\left(\frac{4\pi}{3}, \frac{5\pi}{3}\right)$

8. If $\tan\theta = \sqrt{\frac{3}{2}}$, then the sum of the infinite series $1 + 2(1-\cos\theta) + 3(1-\cos\theta)^2 + 4(1-\cos\theta)^3 + ...\infty$ is

(a) $\frac{2}{3}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{5}{2\sqrt{2}}$ (d) $\frac{5}{2}$

9. Let $A_0A_1A_2A_3A_4A_5$ be a regular hexagon inscribed in a circle of unit radius. Then the product of the lengths of the line segments A_0A_1, A_0A_2 and A_0A_4 is

(a) $\frac{3}{4}$ (b) $3\sqrt{3}$ (c) 3 (d) $\frac{3\sqrt{3}}{2}$

10. If $\sin A + \sin B = C$, $\cos A + \cos B = D$, then the value of $\sin(A+B) =$

(a) CD (b) $\frac{CD}{C^2+D^2}$ (c) $\frac{C^2+D^2}{2CD}$ (d) $\frac{2CD}{C^2+D^2}$

11. If $A + B = 225^o$, then $\frac{\cot A}{1+\cot A} . \frac{\cot B}{1+\cot B} =$

(a) 1 (b) –1 (c) 0 (d) $\frac{1}{2}$

12. $\frac{1}{\sin 10^o} - \frac{\sqrt{3}}{\cos 10^o}$

(a) 0 (b) 1 (c) 2 (d) 4

13. $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta} =$

(a) $\tan 3\theta$ (b) $\cot 3\theta$ (c) $\tan 6\theta$ (d) $\cot 6\theta$

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14. If $\cos(\theta-\alpha), \cos\theta$ and $\cos(\theta+\alpha)$ are in H.P., then $\cos\theta \sec\frac{\alpha}{2}$ is equal to

(a) $\pm\sqrt{2}$ (b) $\pm\sqrt{3}$ (c) $\pm 1/\sqrt{2}$ (d) None of these

15. $\frac{\sin(B+A)+\cos(B-A)}{\sin(B-A)+\cos(B+A)} =$

(a) $\frac{\cos B+\sin B}{\cos B-\sin B}$ (b) $\frac{\cos A+\sin A}{\cos A-\sin A}$ (c) $\frac{\cos A-\sin A}{\cos A+\sin A}$ (d) None of these

16. If $\sin 2x = n\sin 2y$, then the value of $\frac{\tan(x+y)}{\tan(x-y)}$ is

(a) $\frac{n+1}{n-1}$ (b) $\frac{n-1}{n+1}$ (c) $\frac{1-n}{n+1}$ (d) $\frac{1+n}{1-n}$

17. If $3\sin\alpha = 5\sin\beta$, then $\frac{\tan\frac{\alpha+\beta}{2}}{\tan\frac{\alpha-\beta}{2}} =$

(a) 1 (b) 2 (c) 3 (d) 4

18. If $\frac{\pi}{2}<\alpha<\pi,\ \pi<\beta<\frac{3\pi}{2},\ \sin\alpha=\frac{15}{17}$ and $\tan\beta=\frac{12}{5}$, the value of $\sin(\beta-\alpha)$ is

(a) $\frac{-171}{221}$ (b) $\frac{-21}{221}$ (c) $\frac{21}{221}$ (d) $\frac{17}{221}$

19. $\cos^2 76^o + \cos^2 16^o - \cos 76^o \cos 16^o =$

(a) $-\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 0 (d) $\frac{3}{4}$

20. The value of $\cos^2\frac{\pi}{12}+\cos^2\frac{\pi}{4}+\cos^2\frac{5\pi}{12}$ is

(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{3+\sqrt{3}}{2}$ (d) $\frac{2}{3+\sqrt{3}}$

21. If angle θ be divided into two parts such that the tangents of one part is K times the tangent of the other and ϕ is their difference, then $\sin\theta =$

(a) $\frac{K+1}{K-1}\sin\phi$ (b) $\frac{K-1}{K+1}\sin\phi$ (c) $\frac{2K-1}{2K+1}\sin\phi$ (d) None of these

22. If $\tan\alpha, \tan\beta$ are the roots of the equation $x^2+px+q=0\ \ (p\neq 0)$,then

(a) $\sin^2(\alpha+\beta)+p\sin(\alpha+\beta)\cos(\alpha+\beta)+q\cos^2(\alpha+\beta)=q$ (b) $\tan(\alpha+\beta)=\frac{p}{q-1}$

(c) $\cos(\alpha+\beta)=1-q$ (d) $\sin(\alpha+\beta)=-p$

23. If $\tan\alpha$ equals the integral solution of the inequality $4x^2-16x+15<0$ and $\cos\beta$ equals to the slope of the bisector of first quadrant, then $\sin(\alpha+\beta)\ \sin(\alpha-\beta)$ is equal to

(a) $\frac{3}{5}$ (b) $\frac{-3}{5}$ (c) $\frac{2}{\sqrt{5}}$ (d) $\frac{4}{5}$

24. $\frac{\sqrt{2}-\sin\alpha-\cos\alpha}{\sin\alpha-\cos\alpha} =$

(a) $\sec\left(\frac{\alpha}{2}-\frac{\pi}{8}\right)$ (b) $\cos\left(\frac{\pi}{8}-\frac{\alpha}{2}\right)$ (c) $\tan\left(\frac{\alpha}{2}-\frac{\pi}{8}\right)$ (d) $\cot\left(\frac{\alpha}{2}-\frac{\pi}{2}\right)$

25. The sum $S=\sin\theta+\sin 2\theta+.....+\sin n\theta$, equals

(a) $\sin\frac{1}{2}(n+1)\theta\sin\frac{1}{2}n\theta/\sin\frac{\theta}{2}$

(b) $\cos\frac{1}{2}(n+1)\theta\sin\frac{1}{2}n\theta/\sin\frac{\theta}{2}$

(c) $\sin\frac{1}{2}(n+1)\theta\cos\frac{1}{2}n\theta/\sin\frac{\theta}{2}$

(d) $\cos\frac{1}{2}(n+1)\theta\cos\frac{1}{2}n\theta/\sin\frac{\theta}{2}$

26. $\tan 20^o \tan 40^o \tan 60^o \tan 80^o =$

(a) 1 (b) 2 (c) 3 (d) $\sqrt{3}/2$

27. If $\cos\theta = \frac{3}{5}$ and $\cos\phi = \frac{4}{5}$, where θ and ϕ are positive acute angles, then $\cos\frac{\theta-\phi}{2} =$

(a) $\frac{7}{\sqrt{2}}$ (b) $\frac{7}{5\sqrt{2}}$ (c) $\frac{7}{\sqrt{5}}$ (d) $\frac{7}{2\sqrt{5}}$

28. If $\cos(\alpha+\beta) = \frac{4}{5}, \sin(\alpha-\beta) = \frac{5}{13}$ and α, β lie between 0 and $\frac{\pi}{4}$, then $\tan 2\alpha =$

(a) $\frac{16}{63}$ (b) $\frac{56}{33}$ (c) $\frac{28}{33}$ (d) None of these

29. If $x\cos\theta = y\cos\left(\theta+\frac{2\pi}{3}\right) = z\cos\left(\theta+\frac{4\pi}{3}\right)$, then the value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ is equal to

(a) 1 (b) 2 (c) 0 (d) $3\cos\theta$

30. If $a\tan\theta = b$, then $a\cos 2\theta + b\sin 2\theta =$

(a) a (b) b (c) $-a$ (d) $-b$

31. If $2\sec 2\alpha = \tan\beta + \cot\beta$, then one of the values of $\alpha+\beta$ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) π (d) 2π

32. If $\cos x + \cos y + \cos\alpha = 0$ and $\sin x + \sin y + \sin\alpha = 0$, then $\cot\left(\frac{x+y}{2}\right) =$

(a) $\sin\alpha$ (b) $\cos\alpha$ (c) $\cot\alpha$ (d) $\sin\left(\frac{x+y}{2}\right)$

33. If $\sin 2\theta + \sin 2\phi = \frac{1}{2}$ and $\cos 2\theta + \cos 2\phi = \frac{3}{2}$, then $\cos^2(\theta-\phi) =$

(a) $\frac{3}{8}$ (b) $\frac{5}{8}$ (c) $\frac{3}{4}$ (d) $\frac{5}{4}$

34. If $(\sec\alpha+\tan\alpha)(\sec\beta+\tan\beta)(\sec\gamma+\tan\gamma) = \tan\alpha\tan\beta\tan\gamma$, then $(\sec\alpha-\tan\alpha)(\sec\beta-\tan\beta)(\sec\gamma-\tan\gamma) =$

(a) $\cot\alpha\cot\beta\cot\gamma$ (b) $\tan\alpha\tan\beta\tan\gamma$ (c) $\cot\alpha+\cot\beta+\cot\gamma$ (d) $\tan\alpha+\tan\beta+\tan\gamma$

35. If $\cos 2B = \frac{\cos(A+C)}{\cos(A-C)}$, then $\tan A, \tan B, \tan C$ are in

(a) A.P (b) G.P (c) H.P (d) None of these

36. $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right) =$

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{8}$ (d) $\frac{1}{16}$

37. If $\frac{\sin^4 A}{a}+\frac{\cos^4 A}{b} = \frac{1}{a+b}$, then the value of $\frac{\sin^8 A}{a^3}+\frac{\cos^8 A}{b^3}$ is equal to

(a) $\frac{1}{(a+b)^3}$ (b) $\frac{a^3b^3}{(a+b)^3}$ (c) $\frac{a^2b^2}{(a+b)^2}$ (d) None of these

38. $\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$ is equal to

(a) $\cot 7\frac{1}{2}^o$ (b) $\sin 7\frac{1}{2}^o$ (c) $\sin 15^o$ (d) $\cos 15^o$

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39. If $\sin\beta$ is the geometric mean between $\sin\alpha$ and $\cos\alpha$, then $\cos 2\beta$ is equal to

(a) $2\sin^2\left(\frac{\pi}{4}-\alpha\right)$ (b) $2\cos^2\left(\frac{\pi}{4}-\alpha\right)$ (c) $2\cos^2\left(\frac{\pi}{4}+\alpha\right)$ (d) $2\sin^2\left(\frac{\pi}{4}+\alpha\right)$

40. The value of k, for which $(\cos x+\sin x)^2+k\sin x\cos x-1=0$ is an identity, is

(a) –1 (b) – 2 (c) 0 (d) 1

41. If $\sin^3 x\sin 3x=\sum_{m=0}^{n}c_m\cos mx$ where $c_0,c_1,c_2,.....,c_n$ are constants and $c_n\neq 0$, then the value of n is

(a) 15 (b) 6 (c) 1 (d) 0

42. Let $0<x<\frac{\pi}{4}$. Then $\sec 2x-\tan 2x$ =

(a) $\tan\left(x-\frac{\pi}{4}\right)$ (b) $\tan\left(\frac{\pi}{4}-x\right)$ (c) $\tan\left(x+\frac{\pi}{4}\right)$ (d) $\tan^2\left(x+\frac{\pi}{4}\right)$

43. If x is A.M. of $\tan\frac{\pi}{9}$ and $\tan\frac{5\pi}{18}$ and y *is* A.M. of $\tan\frac{\pi}{9}$ and $\tan\frac{7\pi}{18}$, then

(a) $x>y$ (b) $x=y$ (c) $2x=y$ (d) $x=2y$

44. If $\cos^4\theta\sec^2\alpha,\frac{1}{2}$ and $\sin^4\theta\,\text{cosec}^2\alpha$ are in A.P. , then $\cos^8\theta\sec^6\alpha,\frac{1}{2}$ and $\sin^8\theta\,\text{cosec}^6\alpha$ are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

45. Let $f_n(\theta)=\tan\frac{\theta}{2}(1+\sec\theta)(1+\sec 2\theta)(1+\sec 4\theta)\ldots\ldots(1+\sec 2^n\theta)$. 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) All of these

46. If A, B, C, D are the smallest positive angles in ascending order of magnitude which have their sines equal to the positive quantity k, then the value of $4\sin\frac{A}{2}+3\sin\frac{B}{2}+2\sin\frac{C}{2}+\sin\frac{D}{2}$ is equal to

(a) $2\sqrt{1-k}$ (b) $2\sqrt{1+k}$ (c) $2\sqrt{k}$ (d) None of these

47. If α,β are different values of x satisfying $a\cos x+b\sin x=c$, then $\tan\left(\frac{\alpha+\beta}{2}\right)$=

(a) $a+b$ (b) $a-b$ (c) $\frac{b}{a}$ (d) $\frac{a}{b}$

48. Maximum value of $\cos^2 x+\cos^2 y-\cos^2 z$ is

(a) 0 (b) 1 (c) 3 (d) 2

49. Let n be a positive integer such that $\sin\left(\frac{\pi}{2^n}\right)+\cos\left(\frac{\pi}{2^n}\right)=\frac{\sqrt{n}}{2}$, then

(a) $6\le n\le 8$ (b) $4<n\le 8$ (c) $4\le n<8$ (d) $4<n<8$

50. If $\alpha\in\left(0,\frac{\pi}{2}\right)$, then $\sqrt{x^2+x}+\frac{\tan^2\alpha}{\sqrt{x^2+x}}$ is always greater than or equal to

(a) $2\tan\alpha$ (b) 1 (c) 2 (d) $\sec^2\alpha$

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