Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Measurement of angle, Fundamental Identities, sign of trigonometric ratios, allied angles, graphs of trigonometric ratios

A-1. S_1 : $\left(\frac{7\pi}{3}\right)^c = 410^o$

S_2 : $\left(112\frac{1}{2}\right)^\circ = \left(\frac{5\pi}{8}\right)^c$

then which statement is correct

(1) only S_1 (2) S_1 and S_2 both (3) only S_2 (4) neither S_1 nor S_2

A-2. Value of expression $\sin^2\frac{\pi}{6} + \cos^2\frac{\pi}{4} - \sec\frac{\pi}{3}$ is

(1) $\frac{5}{4}$ (2) $\frac{11}{4}$ (3) $-\frac{5}{4}$ (4) –1

A-3. $\frac{1}{\sec\alpha - \tan\alpha} + \frac{1}{\sec\alpha + \tan\alpha} =$

(1) 2 tanα (2) 2 secα (3) 2 sin α (4) 2 cos α

A-4. If a cos θ + b sin θ = 3 & a sin θ − b cos θ = 4 then value of $a^2 + b^2$ is

(1) 25 (2) 14 (3) 7 (4) 50

A-5. If cosec A + cot A = $\frac{11}{2}$, then tan A is equal to

(1) $\frac{21}{22}$ (2) $\frac{15}{16}$ (3) $\frac{44}{117}$ (4) $\frac{117}{43}$

A-6. If tan α + cot α = a then the value of $\tan^4\alpha + \cot^4\alpha$ is equal to

(1) $a^4 + 4a^2 + 2$ (2) $a^4 - 4a^2 + 2$ (3) $a^4 - 4a^2 - 2$ (4) $a^4 + 4a^2 - 2$

A-7. If cosA = $-\frac{5}{13}$ and A is not in third quadrant, then value of sinA – tanA is

(1) $-\frac{96}{65}$ (2) $\frac{96}{65}$ (3) $-\frac{216}{65}$ (4) $\frac{216}{65}$

A-8. cos (540° – θ) – sin (630° – θ) is equal to

(1) 0 (2) 2 cos θ (3) 2 sin θ (4) sin θ – cos θ

A-9. sin 420° cos 390° + cos (–660°) sin (–330°) is equal to

(1) $\frac{1}{2}$ (2) –1 (3) 1 (4) 0

A-10. If tan θ = $-\frac{5}{12}$, θ is not in the second quadrant, then $\frac{\sin(360^0-\theta)+\tan(90^0+\theta)}{-\sec(270^0+\theta)+\operatorname{cosec}(-\theta)}$ =

(1) $\frac{131}{338}$ (2) $\frac{181}{338}$ (3) $-\frac{181}{338}$ (4) $-\frac{131}{338}$

A-11. $\frac{\tan\left(x-\frac{\pi}{2}\right).\cos\left(\frac{3\pi}{2}+x\right)-\sin^3\left(\frac{7\pi}{2}-x\right)}{\cos\left(x-\frac{\pi}{2}\right).\tan\left(\frac{3\pi}{2}+x\right)}$ when simplified reduces to:

(1) $\sin x\cos x$ (2) $-\sin^2 x$ (3) $-\sin x\cos x$ (4) $\sin^2 x$

A-12. The expression $3\left[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi+\alpha)\right]-2\left[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi+\alpha)\right]$ is equal to

(1) 0 (2) 1 (3) 3 (4) sin 4α + sin 6α

A-13. $\sin^2 5^o + \sin^2 10^o + \sin^2 15^o + ...\sin^2 85^o + \sin^2 90^o$ =

(1) 7 (2) 8 (3) $9\frac{1}{2}$ (4) 10

A-14. The value of tan 1° tan 2° tan 3° ... tan 89° is

(1) 1 (2) 0 (3) ∞ (4) $\frac{1}{2}$

A-15. Which of the following is correct -

(1) sin 1° > sin 1 (2) sin 1° < sin 1 (3) cos 1° < cos 1 (4) sin 1° = sin 1

A-16. The sign of the product sin 2 sin 3 sin 5 is-

(1) Negative (2) Positive (3) 0 (4) Non negative

Section (B) : sin(A ± B), cos(A ± B), tan(A ± B), sinC ± sinD, cosC ± cosD, 2sinAcosB , 2cosAsinB, 2cosAcosB, 2sinAsinB formulae

B-1. Value of $\frac{\sin 13^o\cos 47^o+\cos 13^o\sin 47^o}{\cos 72^o\cos 12^o+\sin 72^o\sin 12^o}$ is

(1) 1 (2) 0 (3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{3}$

B-2. The value of $\frac{\sin 24^\circ\ \cos 6^\circ-\sin 6^\circ\sin 66^\circ}{\sin 21^\circ\ \cos\ 39^\circ-\cos 51^\circ\ \sin 69^\circ}$ is

(1) −1 (2) 1 (3) 2 (4) 0

B-3. If 270° < A < 360°, 90° < B < 180°, cos A = $\frac{5}{13}$, tan B = $-\frac{15}{8}$, then the value of cos (A + B) is

(1) $-\frac{140}{221}$ (2) $\frac{140}{221}$ (3) $\frac{220}{221}$ (4) $-\frac{220}{221}$

B-4. If tan A – tan B = x and cot B – cot A = y, then cot (A – B) is equal to

(1) $\frac{1}{y} - \frac{1}{x}$ (2) $\frac{1}{x} - \frac{1}{y}$ (3) $\frac{1}{x} + \frac{1}{y}$ (4) x + y

B-5. The value of $\frac{(\cos 11^\circ + \sin 11^\circ)}{(\cos 11^\circ - \sin 11^\circ)}$ is

(1) –tan 304° (2) tan 56° (3) cot 214° (4) all of these

B-6. If cos (A – B) = $\frac{3}{5}$ and tan A tan B = 2, then

(1) cos A cos B = – $\frac{1}{5}$ (2) sin A sin B = – $\frac{2}{5}$

(3) cos (A + B) = – $\frac{1}{5}$ (4) sin A cos B = $\frac{4}{5}$

B-7. If A + B = 45^0, then (1 + tanA)(1 + tan B) =

(1) 0 (2) 1 (3) 2 (4) 3

B-8. Value of $\sin^2 45^o - \sin^2 15^o$ is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{4}$ (3) $\frac{3}{4}$ (4) $\frac{1}{4}$

B-9. If 3 sinα =5 sinβ, then $\frac{\tan\frac{\alpha+\beta}{2}}{\tan\frac{\alpha-\beta}{2}}$ is equal to

(1) 1 (2) 2 (3) 3 (4) 4

B-10. The value of $\frac{(1+\tan 8^o)(1+\tan 37^o)}{(1+\tan 22^o)(1+\tan 23^o)}$ is

(1) 0 (2) 2 (3) 8 (4) 1

B-11. Expression $\frac{\sin\theta + \sin 2\theta}{\cos\theta - \cos 2\theta}$ is equal to

(1) tan $\frac{\theta}{2}$ (2) sec $\frac{\theta}{2}$ (3) cot $\frac{\theta}{2}$ (4) sin $\frac{\theta}{2}$

B-12. The expression $\frac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x}$ is equal to

(1) cos 2x (2) 2 cos x (3) $\cos^2 x$ (4) 1 + cos x

Section (C) : Multiple and sub-multiple angles

C-1. If A lies in the third quadrant and 3 tan A – 4 = 0, then 5 sin 2A + 3sinA + 4 cosA is equal to

(1) 0 (2) – $\frac{24}{5}$ (3) $\frac{24}{5}$ (4) $\frac{48}{5}$

C-2. If tan 25° = x, then $\frac{\tan 155° - \tan 115°}{1+\tan 155° \ \tan 115°}$ is equal to

(1) $\frac{1-x^2}{2x}$ (2) $\frac{1+x^2}{2x}$ (3) $\frac{1+x^2}{1-x^2}$ (4) $\frac{1-x^2}{1+x^2}$

C-3. $2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos 2(\alpha+\beta) =$

(1) sin 2 α (2) cos 2 β (3) cos 2 α (4) sin 2 β

C-4. If cos A = $\frac{3}{4}$, then the value of $16\cos^2\left(\frac{A}{2}\right) - 32\sin\left(\frac{A}{2}\right)\sin\left(\frac{5A}{2}\right)$ is

(1) – 4 (2) – 3 (3) 3 (4) 4

C-5. If cos θ = $\frac{1}{2}\left(a + \frac{1}{a}\right)$, then cos 3θ in terms of 'a' is

(1) $\frac{1}{4}\left(a^3 + \frac{1}{a^3}\right)$ (2) $\frac{1}{2}\left(a^3 + \frac{1}{a^3}\right)$ (3) $4\left(a^3 + \frac{1}{a^3}\right)$ (4) $\left(a^3 + \frac{1}{a^3}\right)$

C-6. If sin t + cos t = $\frac{1}{5}$ then tan $\frac{t}{2}$ is equal to:

(1) −1, 2 (2) $-\frac{1}{3}$, 2 (3) – 2, $\frac{1}{3}$ (4) $-\frac{1}{6}$

C-7. If sin θ + 7 cos θ = 5, then tan $\frac{\theta}{2}$ is a root of the equation

(1) $x^2 - 6x + 1 = 0$ (2) $6x^2 - x - 1 = 0$ (3) $6x^2 + x + 1 = 0$ (4) $x^2 - x + 6 = 0$

C-8. $\cos^2 48° - \sin^2 12° =$

(1) $\frac{\sqrt{5}-1}{4}$ (2) $\frac{\sqrt{5}+1}{8}$ (3) $\frac{\sqrt{3}-1}{4}$ (4) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C-9. The value of the expression $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right)$ is

(1) $\frac{1}{8}$ (2) $\frac{1}{16}$ (3) $\frac{1}{4}$ (4) 0

Section (D) : sinθ sin(60° + θ) sin(60–θ), conditional identities

D-1. $\frac{\cos 20° + 8\sin 70° \sin 50° \sin 10°}{\sin^2 80°}$ is equal to:

(1) 1 (2) 2 (3) $\frac{3}{4}$ (4) $\frac{1}{2}$

D-2. If A = tan 6º tan 42º and B = cot 66º cot 78º , then value of $\frac{A}{B}$ is

(1) 1 (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) $\frac{1}{4}$

D-3. tan α + 2 tan 2α + 4 tan 4α + 8 cot 8 α =

(1) $\tan \alpha$ (2) $\cot \alpha$ (3) $\cot 16\alpha$ (4) $16 \cot \alpha$

D-4. In any triangle ABC, which is not right angled Σ cosA .cosecB.cosecC is equal to
(1) 1 (2) 2 (3) 3 (4) 0

D-5. If A + B + C = $\frac{3\pi}{2}$, then cos 2A + cos2B + cos2C is equal to
(1) 1 – 4cos A cosB cosC (2) 4 sin A sin B sin C
(3) 1 + 2 cos A cos B cos C (4) 1– 4 sin A sin B sin C

D-6. If α + β + γ = 0, then sin2α + sin2β + sin2γ is equal to
(1) 4cosαcosβcosγ (2) –1– 4cosαcosβcosγ
(3) –4sinαsinβsinγ (4) 4sinαsinβsinγ

Section (E) : Sum of sine and cosine series, product of cosine series, range of trigonometric functions

E-1. The value of $\cos 0 + \cos \frac{\pi}{9} + \cos \frac{2\pi}{9} + \cos \frac{3\pi}{9} + \cos \frac{4\pi}{9} + \cos \frac{5\pi}{9} + \cos \frac{6\,\pi}{9} + \cos \frac{7\pi}{9} + \cos \frac{8\pi}{9}$ is
of $\cos 0 + \cos \frac{\pi}{9} + \cos \frac{2\pi}{9} + \cos \frac{3\pi}{9} + \cos \frac{4\pi}{9} + \cos \frac{5\pi}{9} + \cos \frac{6\,\pi}{9} + \cos \frac{7\pi}{9} + \cos \frac{8\pi}{9}$ dk eku gSA
(1) $\frac{1}{2}$ (2) $-\frac{1}{2}$ (3) 0 (4) 1

E-2. If φ is the exterior angle of a regular polygon of n sides and θ is any constant, then
sin θ + sin (θ + φ) + sin (θ +2φ) + ... up to n terms =
(1) sin nθ (2) sin nφ (3) 2nπ (4) 0

E-3. $\cos \frac{2\pi}{7} \cos \frac{4\pi}{7} \cos \frac{6\pi}{7} =$
(1) $\frac{1}{4}$ (2) $\frac{1}{8}$ (3) $\frac{1}{16}$ (4) $\frac{1}{32}$

E-4. $\cos \frac{\pi}{11} \cos \frac{2\pi}{11} \cos \frac{3\pi}{11} \cos \frac{4\pi}{11} \cos \frac{5\pi}{11} =$
(1) $\frac{1}{4}$ (2) $\frac{1}{8}$ (3) $\frac{1}{16}$ (4) $\frac{1}{32}$

E-5. The value of $\cos \frac{\pi}{10} \cos \frac{2\pi}{10} \cos \frac{4\pi}{10} \cos \frac{8\pi}{10} \cos \frac{16\pi}{10}$ is:
(1) $\frac{\sqrt{10 + 2\sqrt{5}}}{64}$ (2) $-\frac{\cos(\pi/10)}{16}$ (3) $\frac{\cos(\pi/10)}{16}$ (4) $-\frac{\sqrt{10 + 2\sqrt{5}}}{16}$

E-6. The maximum value of 12 sin θ – 9 $\sin^2$ θ is -
(1) 3 (2) 4 (3) 5 (4) 8

E-7. The extreme values of $\cos x \cos\left(\frac{2\pi}{3} + x\right) \cos\left(\frac{2\pi}{3} - x\right)$ are -

(1) $-\frac{1}{4}, \frac{1}{4}$ (2) $0, \frac{1}{4}$ (3) 0, 1 (4) – 1, 1

E-8. The greatest and least value of $y = 10\cos^2 x - 6\sin x\cos x + 2\sin^2 x$ are respectively
(1) 11, 1 (2) 10, 2 (3) 12, – 4 (4) 11, – 1

E-9. The difference between maximum and minimum value of the expression $y = 1 + 2\sin x + 3\cos^2 x$ is
(1) $\frac{16}{3}$ (2) $\frac{13}{3}$ (3) 7 (4) 8

Section (F) : Solution of standard trigonometric equations, Solution of trigonometric equations of type-I,II, III

F-1. General solution of equation sin2x = 1 is
(1) $n\pi - \frac{\pi}{4}, n \in I$ (2) $n\pi + \frac{\pi}{4}, n \in I$ (3) $n\pi + \frac{\pi}{8}, n \in I$ (4) $2n\pi + \frac{\pi}{2}, n \in I$

F-2. The general solution of equation $\cot 3\theta - \cot\theta = 0$ is
(1) $n\pi, n \in I$ (2) $\frac{n\pi}{2}, n \in I$
(3) $n\pi + (-1)^n \frac{\pi}{2}, n \in I$ (4) $(2n + 1)\frac{\pi}{2}, n \in I$

F-3. The general solution of the equation $2\cos 2x = 3.2\cos^2 x - 4$ is
(1) $x = 2n\pi, n \in I$ (2) $x = n\pi, n \in I$ (3) $x = \frac{n\pi}{4}, n \in I$ (4) $x = \frac{n\pi}{2}, n \in I$

F-4. The general solution of equation sinx + sin5x = sin2x + sin4x is :
(1) $\frac{n\pi}{2}$; $n \in I$ (2) $\frac{n\pi}{5}$; $n \in I$ (3) $\frac{n\pi}{3}$; $n \in I$ (4) $\frac{2\ n\pi}{3}$; $n \in I$

F-5. cos4x cos8x − cos5x cos9x = 0 if
(1) cos12x = cos 14 x (2) sin13 x = 0 (3) sinx = 0 (4) all of these

F-6. If $x \in \left[0, \frac{\pi}{2}\right]$, the number of solutions of the equation $\sin 7x + \sin 4x + \sin x = 0$ is:
(1) 3 (2) 5 (3) 6 (4) 2

F-7. General solution of equation $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \quad \tan 2x} = 1$ is
(1) $n\pi + \frac{\pi}{4}, n \in I$ (2) $n\pi - \frac{\pi}{4}, n \in I$ (3) $n\pi, n \in I$ (4) φ

F-8. If $2\tan^2 x - 5\sec x - 1 = 0$ has 7 different roots in $\left[0, \frac{n\pi}{2}\right]$, $n \in N$, then greatest value of n is
(1) 8 (2) 10 (3) 13 (4) 15

F-9. $\frac{\cos 3\theta}{2\cos 2\theta - 1} = \frac{1}{2}$ if

(1) $\theta = n\pi + \frac{\pi}{3}$, $n \in I$
(2) $\theta = 2n\pi \pm \frac{\pi}{3}$, $n \in I$
(3) $\theta = 2n\pi \pm \frac{\pi}{6}$, $n \in I$
(4) $\theta = n\pi + \frac{\pi}{6}$, $n \in I$

F-10. The equation $\sin 3\theta = 4\sin\theta . \sin 2\theta . \sin 4\theta$ in $0 \le \theta \le \pi$ has:
(1) 2 real solutions
(2) 4 real solutions
(3) 6 real solutions
(4) 8 real solutions.

F-11. Total number of solution of $16^{\cos^2 x} + 16^{\sin^2 x} = 10$ in $x \in [0, 3\pi]$ is equal to-
(1) 4 (2) 8 (3) 12 (4) 16

F-12. If $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta \tan 4\theta \tan 7\theta$, then θ =
(1) $\frac{n\pi}{4}$, $n \in I$
(2) $\frac{n\pi}{7}$, $n \in I$
(3) $\frac{n\pi}{12}$; $n \ne 6(2k + 1)$, $(n, k \in I)$
(4) $n\pi$, $n \in I$

Section (G) : Solution of trigonometric equations of type IV, V, simultaneous equations, use of boundness

G-1. General solution of equation $\sqrt{3}\sin\theta - \cos\theta = \sqrt{3}$ is

(1) $n\pi + \frac{\pi}{6} + (-1)^n \frac{\pi}{4}$, $n \in I$
(2) $2n\pi + \frac{\pi}{6} + (-1)^n \frac{\pi}{4}$, $n \in I$
(3) $2n\pi$, $n \in I$
(4) $n\pi - \frac{\pi}{6} + (-1)^n \frac{\pi}{4}$, $n \in I$

G-2. General solution of equation $5\sin\theta + 2\cos\theta = 5$ is

(1) $2n\pi - \frac{\pi}{2}$, $n \in I$
(2) $2n\pi - 2\alpha$ where $\alpha = \tan^{-1}\frac{2}{7}$, $n \in I$
(3) $2n\pi + \frac{\pi}{2}$, $n \in I$
(4) $2n\pi + 2\alpha$ where $\alpha = \tan^{-1}\frac{2}{7}$, $n \in I$

G-3. $\sin^2 x + 2\sin x\cos x - 3\cos^2 x = 0$ if

(1) $\tan x = 3$
(2) $x = n\pi - \frac{\pi}{4}$, $n \in I$
(3) $x = n\pi + \frac{\pi}{4}$, $n \in I$
(4) $x = n\pi - \frac{\pi}{3}$, $n \in I$

G-4. $\sin^2 x - \cos 2x = 2 - \sin 2x$ if

(1) $x = \frac{n\pi}{2}$, $n \in I$
(2) $\tan x = \frac{1}{2}$

(3) $x = (2n + 1)\frac{\pi}{2}$, $n \in I$ (4) $x = n\pi + (-1)^n \sin^{-1}\frac{2}{3}$, $n \in I$

G-5. The most general solution of $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$ is :

(1) $n\pi + \frac{7\pi}{4}$, $n \in I$ (2) $n\pi + (-1)^n \frac{7\pi}{4}$, $n \in I$

(3) $2n\pi + \frac{7\pi}{4}$, $n \in I$ (4) $n\pi + (-1)^n \frac{\pi}{4}$, $n \in I$

G-6. The most general value of θ which satisfies both the equations $\tan\theta = \sqrt{3}$ and $\text{cosec}\,\theta = -\frac{2}{\sqrt{3}}$ is-

(1) $n\pi + \frac{4\pi}{3}$; $n \in I$ (2) $n\pi + \frac{2\pi}{3}$; $n \in I$ (3) $2n\pi + \frac{4\pi}{3}$; $n \in I$ (4) $2n\pi + \frac{2\pi}{3}$; $n \in I$

G-7. If $0 \le x \le 2\pi$, $0 \le y \le 2\pi$ and $\sin x + \sin y = 2$ then the value of $x + y$ is-

(1) π (2) $\frac{\pi}{2}$ (3) 3π (4) 0

G-8. The solution set of equation $\cos^5 x = 1 + \sin^4 x$ is-

(1) $n\pi$, $n \in I$ (2) $2n\pi$, $n \in I$ (3) $4n\pi$, $n \in I$ (4) $\frac{n\pi}{2}$, $n \in I$

Section (H) : Trigonometric Inequalities

H-1. Set of values of x satisfying inequality $2\sin x - \sqrt{3} \ge 0$ is

(1) $\left[2n\pi + \frac{2\pi}{3}, 2n\pi + \frac{4\pi}{3}\right]$, $n \in I$ (2) $\left[2n\pi + \frac{\pi}{3}, 2n\pi + \frac{2\pi}{3}\right]$, $n \in I$

(3) $\left[2n\pi - \frac{\pi}{3}, 2n\pi + \frac{\pi}{3}\right]$, $n \in I$ (4) $\left[2n\pi, 2n\pi + \frac{\pi}{3}\right]$, $n \in I$

H-2. The set of values of x for which $\sin x . \cos^3 x > \cos x . \sin^3 x$, $0 \le x \le 2\pi$, is-

(1) $(0, \pi)$ (2) $\left(0, \frac{\pi}{4}\right)$ (3) $\left(\frac{\pi}{4}, \pi\right)$ (4) $\left(\pi, \frac{3\pi}{2}\right)$

H-3. Let $\alpha = \frac{\pi}{3}$, then the solution set of the inequality $\log_{\sin\alpha}(2 - \cos^2 x) < \log_{\sin\alpha}(1 - \sin x)$,

where $x \in (0, 2\pi)$ and $x \ne \frac{\pi}{2}$, is

(1) $(\alpha, \pi - \alpha)$ (2) $\left(\alpha, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi - \alpha\right)$

(3) $\left(\frac{\pi}{3}, \frac{5\pi}{6}\right)$ (4) $\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$

Section (I) : Height and Distance

I-1. Two pillars of equal height stand on either side of a roadway which is 60 m wide. At a point in the roadway between the pillars, the angle of elevation of the top of pillars are 60º and 30º. The height of the pillars is-

(1) $15\sqrt{3}$ m (2) 15 m (3) $\frac{15}{\sqrt{3}}$ m (4) 20 m

I-2. If the angles of elevation of the top of a tower from two points distant a and b from the base and in the same straight line with it are complementary, then the height of the tower is

(1) ab (2) $\sqrt{ab}$ (3) $\frac{a}{b}$ (4) $\sqrt{\frac{a}{b}}$

I-3. From the top of a cliff 25 m high the angle of elevation of a top of tower is found to be equal to the angle of depression of the foot of the tower. The height of the tower is-

(1) 25 m (2) 50 m (3) 75 m (4) 100 m

I-4. A tree 12 m high, is broken by the wind in such a way that its top touches the ground and makes an angle 60º with the ground. The height from the bottom of the tree from where it is broken by the wind is appoximately

(1) 5.57 m (2) 5.21 (3) 5.36 (4) 5.9

I-5. AB is a vertical pole and C is the middle point. The end A is on the level ground and P is any point on the level ground other than A. The portion CB subtends an angle β at P. If AP : AB = 2 : 1, then β is equal to-

(1) $\tan^{-1}\left(\frac{1}{9}\right)$ (2) $\tan^{-1}\left(\frac{4}{9}\right)$ (3) $\tan^{-1}\left(\frac{5}{9}\right)$ (4) $\tan^{-1}\left(\frac{2}{9}\right)$

Exercise-2

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. In a right angled triangle the hypotenuse is $2\sqrt{2}$ times the perpendicular drawn from the opposite vertex. Then the other acute angles of the triangle are

(1) $\frac{\pi}{3}$ & $\frac{\pi}{6}$ (2) $\frac{\pi}{8}$ & $\frac{3\pi}{8}$ (3) $\frac{\pi}{4}$ & $\frac{\pi}{4}$ (4) $\frac{\pi}{5}$ & $\frac{3\pi}{10}$

2. If sec θ + tan θ = 1/5, then the value of sinθ is

(1) $\frac{12}{13}$ (2) $-\frac{12}{13}$ (3) $\pm\frac{12}{13}$ (4) $\frac{5}{12}$

3. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$ then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 =$

(1) 3 (2) 2 (3) 1 (4) 0

4. In a triangle ABC if tan A < 0 then:

(1) $\tan B.\ \tan C > 1$ (2) $\tan B.\ \tan C < 1$

(3) $\tan B.\ \tan C = 1$ (4) $\tan B.\ \tan C \geq 1$

5. Let N = $\sin^2 \alpha + \cos\left(\frac{\pi}{3} - \alpha\right) . \cos\left(\frac{\pi}{3} + \alpha\right)$ then the value of $\log_2 N$ is
(1) –2 (2) 4 (3) 2 (4) –4

6. If $\alpha \cos^2 3\theta + \beta \cos^4 \theta = 16\cos^6 \theta + 9\cos^2 \theta$ is an identity then -
(1) $\alpha = 1, \beta = 18$ (2) $\alpha = 1, \beta = 24$ (3) $\alpha = 3, \beta = 24$ (4) $\alpha = 4, \beta = 2$

7. If in a triangle ABC, $\angle C = \frac{2\pi}{3}$, then the value of $\cos^2 A + \cos^2 B - \cos A . \cos B$ is equal to-
(1) $\frac{3}{4}$ (2) $\frac{3}{2}$ (3) $\frac{1}{2}$ (4) $\frac{1}{4}$

8. The value of $\frac{1}{\cos 290°} + \frac{1}{\sqrt{3} \sin 250°}$ is
(1) $\frac{2\sqrt{3}}{3}$ (2) $\frac{4\sqrt{3}}{3}$ (3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

9. If $\tan^2 \theta = 2 \tan^2 \varphi + 1$, then the value of $\cos 2\theta + \sin^2 \varphi$ is
(1) 1 (2) 2 (3) – 1 (4) Independent of φ

10. The value of sin 55° – sin 19° + sin 53° – sin 17° is always equal to
(1) cos 1° (2) sin 1° (3) tan 1° (4) – cos 1°

11. $\tan 9° - \tan 27° - \tan 63° + \tan 81° =$
(1) 4 (2) – 4 (3) 0 (4) 2

12. If $a \sec \theta = 1 - b \tan \theta$ and $a^2 \sec^2\theta = 5 + b^2 \tan^2\theta$, then
(1) $a^2b^2 - 4a^2 = 9b^2$ (2) $a^2b^2 + 2a^2 = 9b^2$ (3) $a^2b^2 + 4a^2 = 9b^2$ (4) $a^2b^2 + 4a^2 = 3b^2$

13. If sin x + sin y = a & cos x + cos y = b, then $\tan \frac{x - y}{2} =$
(1) $\pm\sqrt{\frac{4 - a^2 - b^2}{a^2 + b^2}}$ (2) $\pm\sqrt{\frac{4 + a^2 - b^2}{a^2 + b^2}}$
(3) $\pm\sqrt{\frac{2 - a^2 - b^2}{a^2 + b^2}}$ (4) $\pm\sqrt{\frac{4 - a^2 - b^2}{a^2 - b^2}}$

14. $\cot 7\frac{1°}{2} =$
(1) $2 - \sqrt{3}$ (2) $2 + \sqrt{3}$
(3) $\sqrt{2} + \sqrt{3} - \sqrt{4} + \sqrt{6}$ (4) $\sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{6}$

15. If $f(\theta) = (\sin \theta + \text{cosec } \theta)^2 + (\cos \theta + \sec \theta)^2$, then minimum value of $f(\theta)$ is
(1) 7 (2) 8 (3) 9 (4) 2

16. The greatest and least value of $y = 3\cos\left(\theta + \frac{\pi}{3}\right) + 5\cos\theta + 3$ are respectively

(1) 11, –5 (2) 3, –3 (3) 3, 0 (4) 10, – 4

17. The solution of the equation $\log_2(\sin x + \cos x) - \log_2(\cos x) + 1 = 0$:

(1) $\tan^{-1}\left(-\frac{1}{2}\right)$ (2) 0 (3) $\tan^{-1}\left(\frac{1}{2}\right)$ (4) $\frac{\pi}{4}$

18. $\sin x + \sin 2x + \sin 3x = 0$ if

(1) $\sin x = \frac{1}{2}$ (2) $\sin 2x = 0$ (3) $\sin 3x = \frac{\sqrt{3}}{2}$ (4) $\cos x = \frac{1}{2}$

19. $\sin^2 x - \cos 2x = 2 - \sin 2x$ if

(1) $x = \frac{n\pi}{2}$, $n \in I$

(2) $x = n\pi + (-1)^n \tan^{-1}\left(\frac{3}{2}\right)$, $n \in I$

(3) $x = \frac{\pi}{2}(2n + 1)$, $n \in I$

(4) $x = n\pi + (-1)^n \sin^{-1}\frac{2}{3}$, $n \in I$

20. The solution set of the equation $4\sin\theta.\cos\theta - 2\cos\theta - 2\sqrt{3}\sin\theta + \sqrt{3} = 0$ in the interval $(0, 2\pi)$ is

(1) $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}\right\}$ (2) $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$ (3) $\left\{\frac{3\pi}{4}, \pi, \frac{\pi}{3}, \frac{5\pi}{3}\right\}$ (4) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}\right\}$

21. The general solution of the equation $\cos x + \sec x = 2$ is given by -

(1) $2n\pi$; $n \in I$ (2) $n\pi$; $n \in I$ (3) $\frac{n\pi}{4}$; $n \in I$ (4) $\frac{n\pi}{2}$; $n \in I$

22. The general solution of the equation $\sin^{50} x - \cos^{50} x = 1$ is-

(1) $2n\pi + \frac{\pi}{2}$, $n \in I$

(2) $2n\pi + \frac{\pi}{3}$, $n \in I$

(3) $n\pi + \frac{\pi}{2}$, $n \in I$

(4) $n\pi + \frac{\pi}{3}$, $n \in I$

23. The general solution of the equation $7\cos^2 x + \sin x \cos x - 3 = 0$ is given by-

(1) $n\pi + \frac{\pi}{2}$, $n \in I$

(2) $n\pi - \frac{\pi}{4}$, $n \in I$

(3) $n\pi + \tan^{-1}\frac{4}{3}$, $n \in I$

(4) $n\pi - \frac{\pi}{4}$, $k\pi + \tan^{-1}\frac{4}{3}$, $n \in I$

24 The solution of inequality $\cos 2x \le \cos x$ is

(1) $x \in \left[2n\pi - \frac{\pi}{3}, 2n\pi + \frac{\pi}{3}\right]$, $n \in I$

(2) $x \in \left[2n\pi - \frac{2\pi}{3}, 2n\pi + \frac{2\pi}{3}\right]$, $n \in I$

(3) $x \in \left[2n\pi, 2n\pi + \frac{2\pi}{3}\right]$, $n \in I$

(4) $x \in \left[2n\pi - \frac{2\pi}{3}, 2n\pi\right]$, $n \in I$

25. Which of the following set of values of x satisfy the inequation

$\tan^2 x - (1 + \sqrt{3})\tan x + \sqrt{3} < 0$

(1) $\left(\frac{(4n+1)\pi}{4}, \frac{(3n+1)\pi}{3}\right)$, $n \in I$
(2) $\left(\frac{(2n+1)\pi}{4}, \frac{(2n+1)\pi}{3}\right)$, $n \in I$
(3) $\left(\frac{(4n+1)\pi}{4}, \frac{(4n+1)\pi}{3}\right)$, $n \in I$
(4) $\left(n\pi + \frac{\pi}{4}, n\pi + \frac{\pi}{2}\right)$, $n \in I$

26. A round ballon of radius r subtends an angle α at the eye of the observer, while the angle of elevation of its centre is β. The height of the centre of ballon is-

(1) $r \operatorname{cosec} \alpha \sin \frac{\beta}{2}$ (2) $r \sin \alpha \operatorname{cosec} \frac{\beta}{2}$ (3) $r \sin \frac{\alpha}{2} \operatorname{cosec} \beta$ (4) $r \operatorname{cosec} \frac{\alpha}{2} \sin \beta$

27. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30º to 45º, then the car will reach the tower in

(1) 17 minutes 23 seconds
(2) 16 minutes 23 seconds
(3) 16 minutes 18 seconds
(4) 18 minutes 22 seconds

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS :

Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

(1) Both the statements are true.
(2) Statement-I is true, but Statement-II is false.
(3) Statement-I is false, but Statement-II is true.
(4) Both the statements are false.

A-1. **STATEMENT-1 :** sin 2 > sin 3

STATEMENT-2 : If x, y $\in \left(\frac{\pi}{2}, \pi\right)$, x < y, then sin x > sin y

A-2. **STATEMENT-1 :** There is no value of θ for which $\frac{\tan\theta}{\tan 3\theta} = 2$

STATEMENT-2: If $y = \frac{\tan\theta}{\tan 3\theta}$, then $y \in \left(-\infty, \frac{1}{3}\right) \cup (3, \infty) - \{0\}$, where $\theta \neq \frac{n\pi}{3} + \frac{\pi}{6}$, $\theta \neq \frac{m\pi}{3}$, for n, m ∈ I

A-3. **STATEMENT-1 :** In (0, π), the number of solutions of the equation tanθ + tan 2θ + tan 3θ = tan θ.tan2θ.tan3θ is 2.

STATEMENT-2 : Each solution of tan 6θ = 0 is a solution of tanθ + tan 2θ + tan 3θ = tan θ.tan2θ.tan3θ.

A-4. **STATEMENT-1 :** If 0 ≤ x ≤ 3π , 0 ≤ y ≤ 3π and cos x . sin y = 1, then the possible number of values of the ordered pair (x, y) is 3.

STATEMENT-2 : – 1 ≤ sinx ≤ 1, – 1 ≤ cosx ≤ 1

Section (B) : MATCH THE COLUMN

B-1. **Column - I** **Column - II**

(A)	$\tan 9° - \tan 27° - \tan 63° + \tan 81°$	(p)	2
(B)	$2(\text{cosec } 10° - \sqrt{3} \sec 10°)$	(q)	8
(C)	$\sqrt{2} \sin 10° \left[\frac{\sec 5°}{2} + \frac{\cos 40°}{\sin 5°} - 2 \sin 35°\right]$	(r)	3
(D)	$\sqrt{3} (\cot 70° + 4 \cos 70°)$	(s)	4

B-2. **Column – I** **Column – II**

(A)	Number of solutions of $\sin^2\theta + 3 \cos \theta = 3$ in $[-\pi, \pi]$	(p)	2
(B)	If $\sin \theta + \text{cosec } \theta = 2$, then $\sin^{2008}\theta + \text{cosec}^{2008}\theta$ is equal to	(q)	1
(C)	Maximum value of $\sin^4\theta + \cos^4\theta - 1$ is	(r)	0
(D)	Least value of $2 \sin^2\theta + 3 \cos^2\theta - 3$ is	(s)	– 1

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. If $\frac{\sin\alpha}{\sin\beta} = \frac{\sqrt{3}}{2}$ and $\frac{\cos\alpha}{\cos\beta} = \frac{\sqrt{5}}{2}$, $0 < \alpha < \beta < \frac{\pi}{2}$, then

(1) $\tan\alpha = 1$ (2) $\tan\alpha = \frac{\sqrt{3}}{\sqrt{5}}$ (3) $\tan\beta = \frac{\sqrt{3}}{\sqrt{5}}$ (4) $\tan\beta = 1$

C-2. If A and B are acute angle such that A + B and A – B satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0$, then

(1) $A = \frac{\pi}{4}$ (2) $B = \frac{\pi}{6}$ (3) $A = \frac{\pi}{6}$ (4) $B = \frac{\pi}{4}$

C-3. If $\sin\theta = k$ for exactly one value of θ, $\theta \in \left[0, \frac{7\pi}{3}\right]$, then the value of k is :

(1) 1 (2) –1 (3) $\frac{1}{\sqrt{2}}$ (4) 0

C-4. Solution of the equation $\sin 6x + \cos 4x + 2 = 0$; $0 < x < 2\pi$ is :

(1) $x = \frac{\pi}{3}$ (2) $x = \frac{\pi}{4}$ (3) $x = \frac{4\pi}{3}$ (4) $x = \frac{5\pi}{4}$

C-5. sinx, sin2x, sin3x are in A.P if

(1) $x = \frac{n\pi}{2}$, $n \in I$ (2) $x = n\pi$, $n \in I$

(3) $x = 2n\pi$, $n \in I$ (4) $x = (2n+1)\pi$, $n \in I$

C-6. $\sin x + \sin 2x + \sin 3x = 0$ if

(1) $\sin x = \frac{1}{2}$ (2) $\sin 2x = 0$ (3) $\sin 3x = \frac{\sqrt{3}}{2}$ (4) $\cos x = -\frac{1}{2}$

C-7. $5 \sin^2 x + \sqrt{3} \sin x \cos x + 6 \cos^2 x = 5$ if

(1) $\tan x = -\frac{1}{\sqrt{3}}$ (2) $\sin x = 0$

(3) $x = n\pi + \frac{\pi}{6}$, $n \in I$ (4) $x = n\pi - \frac{\pi}{6}$, $n \in I$

C-8. $\cos 15x = \sin 5x$ if

(1) $x = -\frac{\pi}{20} + \frac{n\pi}{5}$, $n \in I$ (2) $x = \frac{\pi}{40} + \frac{n\pi}{10}$, $n \in I$

(3) $x = \frac{3\pi}{20} + \frac{n\pi}{5}$, $n \in I$ (4) $x = -\frac{3\pi}{40} + \frac{n\pi}{10}$, $n \in I$

C-9. Which of the following set of values of x satisfy the inequation $\sin 3x < \sin x$.

(1) $\left(\frac{(8n-1)\pi}{4}, 2n\pi\right)$, $n \in I$ (2) $\left(\frac{(8n-1)\pi}{4}, \frac{(8n+1)\pi}{4}\right)$, $n \in I$

(3) $\left(\frac{(8n+1)\pi}{4}, \frac{(8n+3)\pi}{4}\right)$, $n \in I$ (4) $\left((2n+1)\pi, \frac{(8n+5)\pi}{4}\right)$, $n \in I$

C-10. From the top of building of height h, a tower standing on the ground is observed to make an angle θ. If the horizontal distance between the building and the tower is h, then height of the tower is :

(1) $\frac{2h\sin\theta}{\sin\theta+\cos\theta}$ (2) $\frac{2h\tan\theta}{1+\tan\theta}$ (3) $\frac{2h}{1+\cot\theta}$ (4) $\frac{2h\cos\theta}{\sin\theta+\cos\theta}$