

Trigonometric Functions and Equations

EE24BTECH11001- ADITYA TRIPATHY

A: FILL IN THE BLANKS

- 1) Suppose $\sin^3 x \sin 3x = \sum_{m=0}^n C_m \cos x$ is an identity in x , where C_0, C_1, \dots, C_n are constants and $C_n \neq 0$ then the value of n is

(1981 - 2 Marks)

- 2) The solution set of the system of equations $x + y = \frac{2\pi}{3}$, $\cos x + \cos y = \frac{3}{2}$, where x and y are real, is

(1987 - 2 Mark)

- 3) The set of all x in the interval $[0, \pi]$ for which $2 \sin^2 x - 3 \sin x + 1 \geq 0$, is

(1987 - 2 mark)

- 4) The sides of a triangle in a given circle subtend angles α, β, γ . The minimum value of arithmetic mean of $\cos\left(\alpha + \frac{\pi}{2}\right)$, $\cos\left(\beta + \frac{\pi}{2}\right)$, $\cos\left(\gamma + \frac{\pi}{2}\right)$ is equal to

(1987 - 2 Marks)

- 5) The value of

$$\sin \frac{\pi}{14} \sin \frac{3\pi}{14} \sin \frac{5\pi}{14} \sin \frac{7\pi}{14} \sin \frac{9\pi}{14} \sin \frac{11\pi}{14} \sin \frac{13\pi}{14}$$

is equal to

(1991 - 2 Marks)

- 6) If $K = \sin\left(\frac{\pi}{18}\right) \sin\left(\frac{5\pi}{18}\right) \sin\left(\frac{7\pi}{18}\right)$ then the numerical value of K is

(1993 - 2 Marks)

- 7) If $A > 0, B > 0$ and $A + B = \frac{\pi}{3}$, then the maximum value $\tan A \tan B$ is

(1993 - 2 Marks)

- 8) General value of θ satisfying the equation $\tan^2 \theta + \sec 2\theta = 1$ is

(1996 - 1 Mark)

- 9) The real roots of the equation $\cos^7 x + \sin^4 x = 1$ in the interval $(-\pi, \pi)$ are

(1997 - 2 Marks)

B: TRUE / FALSE

- 1) If $\tan A = \frac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B$

(1981 - 1 Marks)

- 2) There exists a value of θ between 0 and 2π that satisfies the equation $\sin^4 \theta - 2 \sin^2 \theta - 1 = 0$.

(1984 - 1 Marks)

C :MCQs WITH ONE CORRECT ANSWER

- 1) If $\tan \theta = -\frac{4}{3}$ then $\sin \theta$ is

(1979)

- (a) $-\frac{4}{5}$ but not $\frac{4}{5}$ (b) $\frac{4}{5}$ or $-\frac{4}{5}$
(c) $\frac{4}{5}$ but not $-\frac{4}{5}$ (d) None of These

- 2) If $\alpha + \beta + \gamma = 2\pi$

(1979)

- (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) Given $A = \sin^2 \theta + \cos^4 \theta$ then for all real values of θ

(1980)

$$\sin \frac{\pi}{14} \sin \frac{3\pi}{14} \sin \frac{5\pi}{14} \sin \frac{7\pi}{14} \sin \frac{9\pi}{14} \sin \frac{11\pi}{14} \sin \frac{13\pi}{14} \quad 1 \leq A \leq 2 \quad (b) \quad \frac{3}{4} \leq A \leq 1$$

- (c) $\frac{13}{16} \leq A \leq 1$ (d) $\frac{3}{4} \leq A \leq \frac{13}{16}$

- 4) The equation $2 \cos^2 \frac{x}{2} \sin^2 x = x^2 + x^{-2}$

(1980)

- (a) no real solution (b) one real solution
(c) more than one real solution (d) None of these

- 5) The general solution to the trigonometric equation $\sin x + \cos x = 1$ is given by

(1981 - 2 Marks)

- (a) $x = 2n\pi; n = 0, \pm 1, \pm 2 \dots$
(b) $x = 2n\pi + \frac{\pi}{2}, n = 0, \pm 1, \pm 2 \dots$
(c) $x = n\pi + (-1)^n \frac{\pi}{4}, n = 0, \pm 1, \pm 2 \dots$
(d) none of these

- 6) The value of the expression $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$ is equal to

(1988 - 2 Marks)

- (a) 2 (b) $2 \sin 20^\circ / \sin 40^\circ$
(c) 4 (d) $2 \sin 20^\circ / \sin 40^\circ$