

# Trigonometric Functions and Equations

EE24BTECH11001- ADITYA TRIPATHY

## A: FILL IN THE BLANKS

- 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 – 2Marks)
  - $\frac{4}{5}$  or  $\frac{-4}{5}$
  - $\frac{4}{5}$  but not  $\frac{-4}{5}$
  - None of These
- If  $\alpha + \beta + \gamma = 2\pi$  (1979)
  - $\tan \frac{\alpha}{2} + \tan \frac{\beta}{2} + \tan \frac{\gamma}{2} = \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
  - $\tan \frac{\alpha}{2} \tan \frac{\beta}{2} + \tan \frac{\beta}{2} \tan \frac{\gamma}{2} + \tan \frac{\gamma}{2} \tan \frac{\alpha}{2} = 1$
  - $\tan \frac{\alpha}{2} + \tan \frac{\beta}{2} + \tan \frac{\gamma}{2} = -\tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
  - None of These
- The set of all  $x$  in the interval  $[0, \pi]$  for which  $2 \sin^2 x - 3 \sin x + 1 \geq 0$ , is (1987 – 2Marks)
- The sides of a triangle in a given circle subtend angles  $\alpha, \beta, \gamma$ . The minimum value of arithmetic mean of  $\cos(\alpha + \frac{\pi}{2}), \cos(\beta + \frac{\pi}{2}), \cos(\gamma + \frac{\pi}{2})$  is equal to (1987 – 2Marks)
- 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 – 2Marks)
- If  $K = \sin(\frac{\pi}{18}) \sin(\frac{5\pi}{18}) \sin(\frac{7\pi}{18})$  then the numerical value of  $K$  is (1993 – 2Marks)
- If  $A > 0, B > 0$  and  $A + B = \frac{\pi}{3}$ , then the maximum value  $\tan A \tan B$  is (1993 – 2Marks)
- General value of  $\theta$  satisfying the equation  $\tan^2 \theta + \sec 2\theta = 1$  is (1996 – 1Mark)
- The real roots of the equation  $\cos^7 x + \sin^4 x = 1$  in the interval  $(-\pi, \pi)$  are (1997 – 2Marks)

## B: TRUE / FALSE

- If  $\tan A = \frac{1 - \cos B}{\sin B}$ , then  $\tan 2A = \tan B$  (1981 – 1Mark)
- There exists a value of  $\theta$  between 0 and  $2\pi$  that satisfies the equation  $\sin^4 \theta - 2 \sin^2 \theta - 1 = 0$ . (1984 – 1Mark)

## C :MCQs WITH ONE CORRECT ANSWER

- If  $\tan \theta = -\frac{4}{3}$  then  $\sin \theta$  is (1979)
  - $\frac{-4}{5}$  but not  $\frac{4}{5}$

- If  $\alpha + \beta + \gamma = 2\pi$  (1979)
  - $\tan \frac{\alpha}{2} + \tan \frac{\beta}{2} + \tan \frac{\gamma}{2} = \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
  - $\tan \frac{\alpha}{2} \tan \frac{\beta}{2} + \tan \frac{\beta}{2} \tan \frac{\gamma}{2} + \tan \frac{\gamma}{2} \tan \frac{\alpha}{2} = 1$
  - $\tan \frac{\alpha}{2} + \tan \frac{\beta}{2} + \tan \frac{\gamma}{2} = -\tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
  - None of These
- Given  $A = \sin^2 \theta + \cos^4 \theta$  then for all real values of  $\theta$  (1980)
  - $1 \leq A \leq 2$
  - $\frac{3}{4} \leq A \leq 1$
  - $\frac{13}{16} \leq A \leq 1$
  - $\frac{3}{4} \leq A \leq \frac{13}{16}$
- The equation  $2 \cos^2 \frac{x}{2} \sin^2 x = x^2 + x^{-2}$  (1980)
  - no real solution
  - one real solution
  - more than one real solution
  - None of these
- The general solution to the trigonometric equation  $\sin x + \cos x = 1$  is given by (1981 – 2Marks)
  - $x = 2n\pi; n = 0, \pm 1, \pm 2 \dots$
  - $x = 2n\pi + \frac{\pi}{2}; n = 0, \pm 1, \pm 2 \dots$
  - $x = n\pi + (-1)^n \frac{\pi}{4}; n = 0, \pm 1, \pm 2 \dots$
  - none of these
- The value of the expression  $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$  is equal to (1988 – 2Marks)
  - 2
  - $2 \sin 20^\circ / \sin 40^\circ$
  - 4
  - $2 \sin 20^\circ / \sin 40^\circ$