

Choose the correct answer from the given options for each question given below and each carries 2 marks.

1. If  $x = \tan A - \tan B$ ,  $y = \cot B - \cot A$  then  $\frac{1}{x} + \frac{1}{y} =$

- A.  $\cot(A - B)$       B.  $\cot(B - A)$       C.  $\tan(A - B)$       D.  $\tan(B - A)$

2. If  $\tan\left(\frac{\pi}{4} + \theta\right) + \tan\left(\frac{\pi}{4} - \theta\right) = k \sec 2\theta$  then  $k =$

- A. 1      B. 2      C. 3      D. 4

3. If  $\frac{\sin \alpha}{a} = \frac{\cos \alpha}{b}$  then  $a \sin 2\alpha + b \cos 2\alpha =$

- A.  $a$       B.  $a + b$       C.  $b$       D.  $ab$

4. The period of  $\cos(x + 2x + 3x + \dots + nx)$  is

- A.  $\frac{\pi}{n(n+1)}$       B.  $\frac{2\pi}{n(n+1)}$       C.  $\frac{4\pi}{n(n-1)}$       D.  $\frac{4\pi}{n(n+1)}$

5. The general solution of  $4 \sin \theta \cos \theta = 1$  is

- A.  $\frac{n\pi}{2} + (-1)^n \frac{\pi}{12}, n \in \mathbf{Z}$       B.  $n\pi + (-1)^n \frac{\pi}{6}, n \in \mathbf{Z}$   
 C.  $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6}, n \in \mathbf{Z}$       D.  $\frac{n\pi}{2} + (-1)^n \frac{\pi}{6}, n \in \mathbf{Z}$

6. The number of solutions of the trigonometric equation

$$4 \sin^2 \theta + 6 \cos^2 \theta = 10 \text{ in } [0, 2\pi] \text{ is}$$

- A. 3      B. 2      C. 1      D. 0

7. If  $\alpha, \beta$  are solutions of  $a \cos 2\theta + b \sin 2\theta = c$  then  $\tan \alpha \cdot \tan \beta =$

- A.  $\frac{c-a}{c+a}$       B.  $\frac{c+a}{c-a}$       C.  $\frac{a-c}{c+a}$       D.  $\frac{2b}{c+a}$

8.  $\tan\left(\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)\right) =$

A. 5

B. 1

C. 4

D. 2

9. If  $\sin^{-1}\left(\frac{3}{x}\right) + \sin^{-1}\left(\frac{4}{x}\right) = \frac{\pi}{2}$  then  $x =$

A. 3

B. 7

C. 5

D. 11

10. Consider the following statements:

I.  $\tan^{-1}(2) + \tan^{-1}(3) = \frac{3\pi}{4}$

II.  $\cos\left(\cos^{-1}\left(-\frac{1}{7}\right) + \sin^{-1}\left(-\frac{1}{7}\right)\right) = 0$ , then

A. Only I is true

B. Only II is true

C. Neither I nor II is true

D. Both I and II are true

## Section B ( $2 \times 5 = 10 M$ )

**Answer any TWO of the following questions**

11. Prove that  $\sin^4\left(\frac{\pi}{8}\right) + \sin^4\left(\frac{3\pi}{8}\right) + \sin^4\left(\frac{5\pi}{8}\right) + \sin^4\left(\frac{7\pi}{8}\right) = \frac{3}{2}$ .

12. If  $A, B, C$  are the angles in a triangle then prove that  $\sin 2A - \sin 2B + \sin 2C = 4 \cos A \sin B \cos C$ .

13. If  $x + y = \frac{2\pi}{3}$  and  $\sin x + \sin y = \frac{3}{2}$  then find  $x$  and  $y$ .

14. If  $\cos^{-1}\left(\frac{p}{a}\right) + \cos^{-1}\left(\frac{q}{b}\right) = \alpha$  then prove that  $\frac{p^2}{a^2} - 2\frac{pq}{ab}\cos\alpha + \frac{q^2}{b^2} = \sin^2\alpha$ .