

THE ZENITH Questions

For CRT - 07

BY O.P. GUPTA

Max. Marks : 40

INDIRA AWARD WINNER

Time : 60 Minutes

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Topics : Trigonometric Functions

Advanced MATH Classes, 1st Floor (Above Master Of Burgers), Opp. HP Petrol Pump, Thana Road, Najafgarh

- Q01.** (a) If $\sin \theta + \cos \theta = a$, then find the value of $|\sin \theta - \cos \theta|$.
- (b) If $\tan \theta = \frac{a}{b}$, then what is the value of $a \sin 2\theta + b \cos 2\theta$?
- (c) What is the value of $\cot\left(\frac{\pi}{4} + \theta\right) \cot\left(\frac{\pi}{4} - \theta\right)$?
- (d) Write the value of $\tan 75^\circ - \cot 75^\circ$. [2 × 4 = 8]
- Q02.** If $x \sin \theta = y \sin(\theta + 2\alpha)$, then prove that $\tan(\theta + \alpha) \cot \alpha = \frac{x + y}{x - y}$.
- Q03.** (a) Find the value of $\operatorname{cosec} 22^\circ 30'$.
- (b) If $\cos\left(\frac{\pi \tan \theta}{4}\right) = \sin\left(\frac{\pi \cot \theta}{4}\right)$, then what is the value of θ ? [4 × 2 = 8]
- Q04.** If $\tan \theta = \frac{\sin \phi - \cos \phi}{\sin \phi + \cos \phi}$, then show that $\sin \phi + \cos \phi = \sqrt{2} \cos \theta$.
- Q05.** Solve : $\tan x + \cot x = 2 \operatorname{cosec} x$.
- Q06.** Evaluate : $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8}$.
- Q07.** If $x = y \cos \frac{2\pi}{3} = z \cos \frac{4\pi}{3}$, find the value of $xy + yz + zx$.
- OR** If $\tan(A - B) = 1$, $\sec(A + B) = \frac{2}{\sqrt{3}}$, then find the smallest value of B , $B > 0$. [6 × 4 = 24]

INDIRA Award Winner O.P. Gupta is author of several popular books on Mathematics for Classes XII and XI. These books can be bought at : www.iMathematicia.com.

Hints & Answers Of CRT-07

- Q01.** (a) See NCERT Exemplar Q63 (ii) (b) See NCERT Exemplar Q58
(c) See NCERT Exemplar Q63 (ii) (d) See NCERT Exemplar Q38
- Q02.** See NCERT Exemplar Q03.

Q03. (a) $\operatorname{cosec} 22^{\circ} 30' = \frac{1}{\sin 22^{\circ} 30'} = \frac{1}{\sqrt{\frac{1 - \cos 2(22^{\circ} 30')}{2}}} = \sqrt{\frac{2}{1 - \cos 45^{\circ}}} = \sqrt{\frac{2\sqrt{2}}{\sqrt{2} - 1}}$.

(b) $\pi/4$.

Q05. $x = 2n\pi \pm \pi/3, n \in Z$ (See NCERT Exemplar Q17).

Q04. See NCERT Exemplar Q14.

Q06. $3/2$ (See NCERT Exemplar Q29).

Q07. As $x = y \cos \frac{2\pi}{3} = z \cos \frac{4\pi}{3} \Rightarrow x = y \left(-\frac{1}{2}\right) = z \left(-\frac{1}{2}\right)$

i.e., $-2x = y = z = k$ (say) $\Rightarrow x = -k/2, y = k, z = k$

Now $xy + yz + zx = (-k/2)k + k.k + k.(-k/2)$

$\Rightarrow xy + yz + zx = -\frac{k^2}{2} + k^2 - \frac{k^2}{2} = 0$.

OR Here $\tan(A - B) = 1, \sec(A + B) = \frac{2}{\sqrt{3}}$

$\Rightarrow \tan(A - B) = \tan \frac{\pi}{4}, \cos(A + B) = \frac{\sqrt{3}}{2} = \cos \frac{\pi}{6}$

$\Rightarrow (A - B) = n\pi + \frac{\pi}{4}, (A + B) = 2n\pi \pm \frac{\pi}{6}, n \in Z$

Consider $(A + B) - (A - B) = \left(2n\pi \pm \frac{\pi}{6}\right) - \left(n\pi + \frac{\pi}{4}\right), n \in Z$

$\Rightarrow 2B = n\pi - \frac{\pi}{12}$ or $n\pi - \frac{5\pi}{12}, n \in Z$

When $n = 1, 2B = \pi - \frac{\pi}{12}$ or $\pi - \frac{5\pi}{12}$ i.e., $B = \frac{11\pi}{24}$ or $\frac{7\pi}{24}$.

So, clearly the least positive value of B is $\frac{7\pi}{24}$.

❖ Dear Student/Teacher,

I would urge you for a little favour. Please notify me about any error (s) which you notice in this (or other Maths) work. It would be beneficial for all the future learners of Maths like us. Any constructive criticism will be well acknowledged.

Please find below my contact info when you decide to offer your valuable suggestions. I am looking forward for a response.

Moreover, I would wish **if you inform your friends/students** about my efforts for Maths so that they may also be benefited.

Let's learn Maths with smile :-)

☞ For any clarification(s), please contact :

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