6. TRIGONOMETRY

Two marks

1. Prove that $\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$

2. Prove that $\cot\theta + \tan\theta = \sec\theta \operatorname{cosec}\theta$

3. Prove that $(\operatorname{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$

4. Prove that $\dfrac{\text{Sin A}}{1+\text{Cos A}} = \dfrac{1-\text{Cos A}}{\text{Sin A}}$

5. Prove that $\dfrac{\text{Sin A}}{1+\text{Cos A}} + \dfrac{\text{Sin A}}{1-\text{Cos A}} = 2\text{cosecA}$

6. Prove that $\dfrac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$

7. Prove that $1 + \dfrac{\cot^2\theta}{1+\operatorname{cosec}\theta} = \operatorname{cosec}\theta$

8. Prove that $\sec\theta - \cos\theta = \tan\theta \sin\theta$

9. Prove that $\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

10. Prove that $\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} = \sec\theta + \tan\theta$

11. Prove that $\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

12. Prove that $\dfrac{\sec\theta}{\sin\theta} - \dfrac{\sin\theta}{\cos\theta} = \cot\theta$

13. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then prove that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

14. Prove that $\left(\frac{1+\tan^2 A}{1+\cot^2 A}\right) = \left(\frac{1-\tan A}{1-\cot A}\right)^2$

15. A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower

16. A kite is flying at a height of 75 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

17. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of a tower of height $10\sqrt{3}$ m.

18. A road is flanked on either side by continuous rows of houses of height $4\sqrt{3}$ m with no space in between them. A pedestrian is standing on the median of the road facing a row house. The angle of elevation from the pedestrian to the top of the house is 30°. Find the width of the road.

Five marks

1 .If $\operatorname{cosec}\theta + \cot\theta = P$, then prove that $\cos\theta = \frac{P^2-1}{P^2+1}$

2. Prove that $\left(\frac{\cos^3 A - \sin^3 A}{\cos A - \sin A}\right) - \left(\frac{\cos^3 A + \sin^3 A}{\cos A + \sin A}\right) = 2\sin A \cos A$

3. Prove that $\frac{(1+\cot A + \tan A)(\sin A - \cos A)}{\operatorname{Sec}^3 A - \operatorname{cosec}^3 A} = \sin^2 A \cos^2 A$

4. If $\frac{\cos^2\theta}{\sin\theta} = p$ and $\frac{\sin^2\theta}{\cos\theta} = q$ then prove that $p^2 q^2 (p^2+q^2+3)=1$

5. If $\frac{\cos\alpha}{\cos\beta} = p$ and $\frac{\cos\alpha}{\sin\beta} = q$ then prove that $(m^2+n^2)\cos^2\beta = n^2$

6. If $\cot\theta + \tan\theta = p$ and $\sec\theta - \cos\theta$, then prove that $(x^2y)^{2/3} - xy^2)^{2/3} = 1$

7. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \operatorname{cosec}\theta = q$, then prove that $q(p^2-1) = 2p$

8. If $\frac{\cos\theta}{1+\sin\theta} = \frac{1}{a}$, the prove that $\frac{a^2-1}{a^2+1} = \sin\theta$

9. If $\sin\theta\,(1+\sin2\theta) = \cos2\theta$, then prove that $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$

10. If $3\sin\theta - \cos\theta = 0$, then show that $\tan3\theta = \frac{3\tan\theta - \tan^3\theta}{1 - 3\tan^3\theta}$

11. Two ships are sailing in the sea on either sides of a lighthouse. The angles of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200 m high, find the distance between the two ships.

12. From a point on the ground, the angles of elevation of the bottom and top of a tower fixed at the top of a 30 m high building are 45° and 60° respectively. Find the height of the tower

13. To a man standing outside his house, the angles of elevation of the top and bottom of a window are 60° and 45° respectively. If the height of the man is 180 cm and if he is 5 m away from the wall, what is the height of the window?

14. The top of a 15 m high tower is observed from the bottom and the top on an electric pole with an angle of elevation of 60° and 30° respectively. What is the height of the electric pole?

15. From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree

16. The horizontal distance between two buildings is 70 m. The angle of depression of the top of the first building when seen from the top of the second building is 45°. If the height of the second building is 120 m, find the height of the first building

17. From the top of the tower 60 m high the angles of depression of the top and bottom of a vertical lamp post are observed to be 38° and 60° respectively. Find the height of the lamp post .

18. An aeroplane at an altitude of 1800 m finds that two boats are sailing towards it in the same direction. The angles of depression of the boats as observed from the aeroplane are 60° and 30° respectively. Find the distance between the two boats.

19. A pole 5 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point '*A*' on the ground is 60° and the angle of depression to the point '*A*' from the top of the tower is 45°. Find the height of the tower

20. From the top of a tree of height 13 m the angle of elevation and depression of the top and bottom of another tree are 45° and 30° respectively. Find the height of the second tree.

21. A man is standing on the deck of a ship, which is 40 m above water level. He observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30° . Calculate the distance of the hill from the ship and the height of the hill.

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