AMRITA VIDYALAYAM
HALF YEARLY EXAMINATION 2017 - '18

Class : X

Marks : 80
Time   : 3 hrs

MATHEMATICS

> *GENERAL INSTRUCTIONS:*
> *1. All questions are compulsory.*
> *2. This question paper consists of 30 questions divided into four sections; A, B, C and D.*
> *3. Section A consists of 6 questions of 1 mark each, Section B consists of 6 questions of 2 marks each, Section C consists of 10 questions of 3 marks each and Section D consists of 8 questions of 4 marks each.*

SECTION - A

1. Find a quadratic polynomial whose zeroes are $5 + \sqrt{2}$ and $5 - \sqrt{2}$.
2. Find the value of 'a' so that the point (3, a) lies on the line represented by $2x - 3y = 5$.
3. For what value of 'p' will the quadratic equation have real roots?
   $px^2 + 4x + 1 = 0$
4. For a quadratic equation $ax^2 + bx + c = 0$, if discriminant is equal to zero, then where will its graph touch the x-axis?
5. In the given figure, AD = 4 cm, BD = 3 cm and CB = 12 cm. Find cot θ.
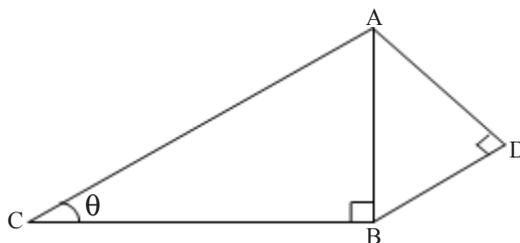
6. A vertical pole is 10 m high and the length of its shadow is $10\sqrt{3}$ m, what is the angle of elevation of the sun?

SECTION - B

7. If 1 is a zero of the polynomial $p(x) = ax^2 – 3(a - 1) x - 1$, then find the value of 'a'.
8. Solve $9x + 10y = 29$
   $10x + 9y = 28$

<div align="center">OR</div>

   For what value of k does the system of equation $kx + 2y - 1 = 0$ and $5x - 3y + 2 = 0$ has no solution.
9. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also find the other root.
10. Use Euclid's Division Lemma to show that the square of any positive integer is either of the form 3m or 3m + 1 for some integer m.
11. Find the value of
$$\frac{\cot 40^0}{\tan 50^0} - \frac{1}{2}\left[\frac{\cos 35^0}{\sin 55^0}\right]$$

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12. If Sin $(A - B) = \frac{1}{2}$, Cos $(A + B) = \frac{1}{2}$, find A and B.

SECTION - C

13. If α and β are zeroes of a quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeroes are 2α and 2β.

OR

If α and β are zeroes of a quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$, find the quadratic polynomial.

14. Solve for x and y.

$ax + by = a - b$

$bx - ay = a + b$

15. Solve for x.

$$\frac{4}{x - 1} - \frac{5}{x + 2} = \frac{3}{x} , x \neq 1, 0, -2$$

OR

The difference of two numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers.

16. A two digit number is such that the product of its digits is 14. When 45 is added to the number, then the digits interchange their places. Find the number.

17. Prove that $\sqrt{7}$ is irrational.

18. The LCM of 2 numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one number is 280, find the other number.

19. Prove that $(1 + \tan \theta + \sec \theta)(1 + \cot \theta - \csc \theta) = 2$.

20. If $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$, show that $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$.

21. As observed from the top of a 60 m high light house from the sea level, the angles of depression of two ships are 30^0 and 45^0. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships.

22. The angle of elevation of the top of a hill from the foot of a tower is 60^0 and the angle of depression of the foot of the hill from the top of the tower is 30^0. If the tower is 50 m high, find the height of the hill.

SECTION - D

23. Obtain all other zeroes of the polynomial $2x^4 + 3x^3 - 15x^2 - 24x - 8$, if two of its zeroes are $2\sqrt{2}$ and $-2\sqrt{2}$.

24. Divide $x^4 + 4x^2 + 16$ by $x^2 - 2x + 4$ and verify the division algorithm.

25. 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by 1 man alone and that by 1 boy alone to finish the work.

26. Solve graphically the system of linear equations.

$x - y + 1 = 0$

$3x + 2y - 12 = 0$

Also find the area bounded by these lines and x-axis.

27. Solve for θ.

$$\frac{\cos \theta}{\csc \theta + 1} + \frac{\cos \theta}{\csc \theta - 1} = 2$$

OR

If $\sec\theta + \tan\theta = p$, S.T $\dfrac{P^2 - 1}{P^2 + 1} = \sin\theta$.

28. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30^0. A girl standing on the roof of a 20 m high building finds the angle of elevation of the same bird to be 45^0. Both the boy and girl are on the opposite sides of the bird. Find the distance of the bird from the girl.

<div align="center">OR</div>

The angle of elevation of a jet plane from a point A on the ground is 60^0. After a flight of 15 seconds, the angle of elevation changes to 30^0. If the jet plane is flying at a constant height of $1500\ \sqrt{3}$ m, find the speed of the jet plane.

29. A person standing on the bank of a river observes that the angle of elevation of a building of an organization, working for conservation of wild life, standing on opposite bank is 60^0. When he moves 40 m away from the bank he finds the angle of elevation to be 30^0.
a) Find the height of the building and the width of the river.
b) Why do we need to conserve wild life?
c) Suggest some steps that can be taken to conserve wild life.

30. A motor boat whose speed in still water is 18 km per hour, takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.