DALMIA HIGHER SECONDARY SCHOOL
DALMIAPURAM – 621651
Std : 12 MATHEMATICS TIME: 1.50HRS
CHAPTER – 5 TEST -1 MARKS : 50

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2 MARKS : ANSWERS ANY 10 Q 10X 2 = 20

1. Find the general equation of a circle with centre $(-3, -4)$ and radius 3 units.

2. Find the general equation of the circle whose diameter is the line segment joining the points $(-4, -2)$ and $(1, 1)$

3. Examine the position of the point $(2, 3)$ with respect to the circle $x^2 + y^2 - 6x - 8y + 12 = 0$

4. Find the equation of the parabola whose vertex is $(5, -2)$ and focus $(2, -2)$.

5. Find the vertex, focus, directrix, and length of the latus rectum of the parabola $x^2 - 4x - 5y - 1 = 0$

6. The orbit of Halley's Comet is an ellipse 36.18 astronomical units long and by 9.12 astronomical units wide. Find its eccentricity

7. Find the equations of tangent and normal to the ellipse $x^2 + 4y^2 = 32$ when $\theta = \frac{\pi}{4}$

8. A concrete bridge is designed as a parabolic arch. The road over bridge is 40m long and the maximum height of the arch is 15m. Write the equation of the parabolic arch.

9. Obtain the equation of the circle for which $(3, 4)$ and $(2, -7)$ are the ends of a diameter.

10. A circle of area 9π square units has two of its diameters along the lines $x + y = 5$ and $x - y = 1$ Find the equation of the circle.

11. If $y = 2\sqrt{2x} + c$ is a tangent to the circle $x^2 + y^2 = 16$, find the value of c .

3 MARKS : ANSWERS ANY 10 Q 5 X 3 = 15

12. If the equation of the ellipse is $\frac{(x-1)^2}{484} + \frac{y^2}{64} = 1$ (x and y are measured in centimetres) where to the nearest centimetre, should the patient's kidney stone be placed so that the reflected sound hits the kidney stone?

13. If the equation $3x^2 + (3 - p)xy + qy^2 - 2px = 8pq$ represents a circle, find p and q . Also determine the centre and radius of the circle

14. Find the equation of the hyperbola in each of the cases given below: foci $(\pm 2, 0)$ eccentricity $= \frac{3}{2}$.

15. Identify the type of conic and find centre, foci, vertices, and directrices of $\frac{x^2}{25} + \frac{y^2}{9} = 1$

16. Find the equations of the two tangents that can be drawn from (5, 2) to the ellipse $2x^2 + 7y^2 = 14$

17. Prove that the point of intersection of the tangents at 't_1' and 't_2' on the parabola $y^2 = 4$axis at $[at_1t_2, a(t_1 + t_2)]$.

18. If the normal at the point 't_1' on the parabola $y^2 = 4$axmeets the parabola again at the point 't_2', then prove that $t_2 = -\left(t_1 + \frac{2}{t_2}\right)$.

19. At a water fountain, water attains a maximum height of 4m at horizontal distance of 0.5m from its origin. If the path of water is a parabola, find the height of water at a horizontal distance of 0.75m from the point of origin.

5 MARKS : ANSWERS ANY 1 Q 3 X 5 =1 5

20. A bridge has a parabolic arch that is 10m high in the centre and 30m wide at the bottom. Find the height of the arch 6m from the centre, on either sides.

21. A tunnel through a mountain for a four lane highway is to have a elliptical opening. The total width of the highway (not the opening) is to be 16m, and the height at the edge of the road must be sufficient for a truck 4m high to clear if the highest point of the opening is to be 5m approximately . How wide must the opening be?

22. At a water fountain, water attains a maximum height of 4m at horizontal distance of 0.5 mfrom its origin. If the path of water is a parabola, find the height of water at a horizontal distance of 0.75m from the point of origin.

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2 MARKS : ANSWERS ANY 10 Q **12 X 2 = 24**

1. Find centre and radius of the following circles. $x^2 + (y+2)^2 = 0$
2. Find centre and radius of the following circles $x^2 + y^2 - x + 2y - 3 = 0$
3. Find centre and radius of the following circles $2x^2 + 2y^2 - 6x + 4y + 2 = 0$
4. Find the equation of the parabola in each of the cases given below end points of latus rectum
$(4, -8)$ and $(4, 8)$
5. Find the equation of the ellipse in each of the cases given below: foci $(\pm 3, 0)$, $e = \frac{1}{2}$.
6. Find the equation of the ellipse in each of the cases given below: foci $(0, \pm 4)$ and end points of major axis are $(0, \pm 5)$
7. Find the equation of the ellipse in each of the cases given below:
length of latus rectum 8, eccentricity = $\frac{3}{5}$, centre (0, 0) and major axis on x -axis.
8. Find the equation of the ellipse in each of the cases given below:
length of latus rectum 4 , distance between foci $4\sqrt{2}$, centre (0, 0) and major axis as y - axis.
9. Find the vertex, focus, equation of directrix and length of the latus rectum of $y^2 = -8x$
10. Identify the type of conic section for each of the equations. $11x^2 - 25y^2 - 44x + 50y - 256 = 0$
11..Identify the type of conic section for each of the equations. $y^2 + 4x + 3y + 4 = 0$
12. Find the equation of the tangent at t = 2 to the parabola $y^2 = 8x$. (Hint: use parametric form)

3 MARKS : ANSWERS ALL QUESTIONS **7 X 3 = 21**

13. The line $3x + 4y - 12 = 0$ meets the coordinate axes at A and B . Find the equation of the circle drawn on AB as diameter.

14. Find the vertices, foci for the hyperbola $9x^2 - 16y^2 = 144$.

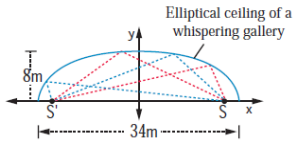
15. Find the equations of tangent and normal to the parabola $x^2 + 6x + 4y + 5 = 0$ at $(1, -3)$.

16. The maximum and minimum distances of the Earth from the Sun respectively are 152×10^6km and 94.5×10^6km. The Sun is at one focus of the elliptical orbit. Find the distance from the Sun to the other focus.

17.The parabolic communication antenna has a focus at 2m distance from the vertex of the antenna. Find the width of the antenna 3m from the vertex.

18. The equation $y = \frac{1}{32}x^2$ models cross sections of parabolic mirrors that are used for solar energy. There is a heating tube located at the focus of each parabola; how high is this tube located above the vertex of the parabola?

19. An equation of the elliptical part of an optical lens system is $\frac{x^2}{16} + \frac{y^2}{9} = 1$The parabolic part of the system has a focus in common with the right focus of the ellipse .The vertex of the parabola is at the origin and the parabola opens to the right. Determine the equation of the parabola.

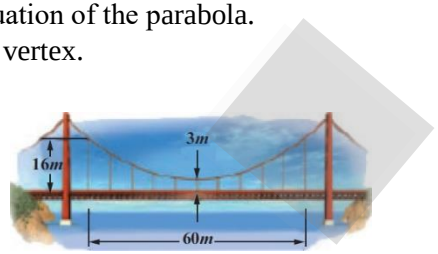


20. A room 34m long is constructed to be a whispering gallery. The room has an elliptical ceiling, as shown in Figure. If the maximum height of the ceiling is 8m, determine where the foci are located.

5 MARKS : ANSWERS ANY 1 Q **1X 5 = 5**

21. An engineer designs a satellite dish with a parabolic cross section. The dish is 5m wide atthe opening, and the focus is placed 1.2 m from the vertex (a) Position a coordinate system with the origin at the vertex and the x -axis on the parabola's axis of symmetry and find an equation of the parabola.
(b) Find the depth of the satellite dish at the vertex.

22. Parabolic cable of a 60m portion of the roadbed of a suspension bridge are positioned as shown below.Vertical Cables are to be spaced every 6m along this portion of the roadbed. Calculate the lengths of first two of these vertical cables from the vertex.



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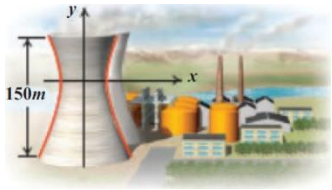
5 MARKS : ANSWER ALL QUESTIONS: 20X 5 = 100

1. Cross section of a Nuclear cooling tower is in the shape of a hyperbola with equation $\frac{x^2}{30^2} - \frac{y^2}{44^2} = 1$.The tower is 150m tall and the distance from the top of the tower to the centre of the hyperbola is half the distance



from the base of the tower to the centre of the hyperbola.
Find the diameter of the top and base of the tower.

2.A rod of length 1.2 m moves with its ends always touching the coordinate
axes. The locusof a point P on the rod, which is 0.3 m from the end in contact with x -axis is an ellipse.Find the eccentricity.

3. Assume that water issuing from the end of a horizontal pipe, 7.5 m above the
ground, describes a parabolic path. The vertex of the parabolic path is at the end of the pipe. At aposition 2.5m below the line of the pipe, the flow of water has curved outward 3m beyond the vertical line through the end of the pipe. How far beyond this vertical line
will the water strike the ground?

4. On lighting a rocket cracker it gets projected in a parabolic path and reaches a maximum height of 4m when it is 6m away from the point of projection. Finally it reaches the ground 12m away from the starting point. Find the angle of projection.

5.Points A and B are 10km apart and it is determined from the sound of an explosion heardat those points at different times that the location of the explosion is 6 km closer to Athan B . Show that the location of the explosion is restricted to a particular curve and find an equation of it.

6..Draw the graph of $\cos x \ \ in\ [0,\pi]$ and $cos^{-1}x\ in\ [-1,1]$

7.Find the equation of the circle through the points $(1, 0)$,$(-1,0)$ and $(0,1)$.

8. Find the vertex, focus, directrix, and length of the latus rectum of the parabolax^2-4x-5y-1 = 0.

9.Find the equation of the ellipse whose eccentricity is$\frac{1}{2}$, one of the foci is (2, 3) and a directrix is x = 7 . Also find the length of the major and minor axes of the ellipse.

10. Find the foci, vertices and length of major and minor axis of the conic $4x^2+36y^2+40x - 288y+532 = 0$.

11. For the ellipse $4x^2+y^2+24x - 2y+21= 0$, find the centre, vertices, and the foci. Also prove that the length of latus rectum is 2 .

12. Find the centre, foci, and eccentricity of the hyperbola $11x^2- 25y^2- 44x +50y-256= 0$

13. Find the vertex, focus, equation of directrix and length of the latus rectum of the following: (iv) $x^2- 2x +8y+17=0$ (v) $y^2- 4y-8x+12=0$

14. Identify the type of conic and find centre, foci, vertices, and directrices of each of the following :

(i) $18x^2+12y^2- 144x +48y+120 = 0$ (ii) $9x^2-y^2-36x-6y+18 = 0$

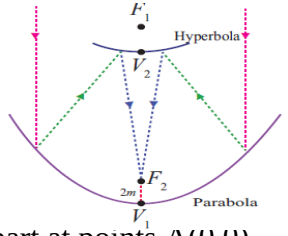
15. the equations of tangent and normal to the parabola $x^2+6x+4y+5 = 0$at (1,-3).

16. Find the equations of tangent and normal to the ellipse $x^2+4y^2 = 32$ when $\theta = \frac{\pi}{4}$.

17. Find the equations of the two tangents that can be drawn from (5, 2) to the ellipse $2x^2+7y^2= 14$

18. Find the equations of tangents to the hyperbola $\frac{x^2}{16} - \frac{y^2}{64} = 1$which are parallelto$10x- 3y+9= 0$.

19. semielliptical archway over a one-way road has a height of 3m and a width of 12m. The truck has a width of 3m and a height of 2.7m. Will the truck clear the opening of the archway?



20. Two coast guard stations are located 600 km apart at points A(0,0) and B(0,600) . A distress signal from a ship at P is received at slightly different times by two stations. It is determined that the ship is 200 km farther from station A than it is from station B . Determine the equation of hyperbola that passes through the location of the ship.