CENTUM ACHIEVERS' ACADEMY

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XII STANDARD	TWO DIMENSIONAL ANALYTICAL GEOMETRY	TIME : 2 ½ Hrs
		MARKS : 100

PART-A

Choose the correct or the most suitable answer : **(20× 1 = 20)**

1. The equation of the circle passing through (1,5) and (4,1) and touching y-axis is $x^2 + y^2 - 5x - 6y + 9 + \lambda(4x + 3y - 19) = 0$ where λ is equal to
   (1) $0, -\frac{40}{9}$ (2) 0 (3) $\frac{40}{9}$ (4) $\frac{-40}{9}$
2. The circle $x^2 + y^2 = 4x + 8y + 5$ intersects the line $3x - 4y = m$ at two distinct points if
   (1) $15 < m < 65$ (2) $35 < m < 85$
   (3) $-85 < m < -35$ (4) $-35 < m < 15$
3. The length of the diameter of the circle which touches the x-axis at the point (1,0) and passes through the point (2,3).
   (1) $\frac{6}{5}$ (2) $\frac{5}{3}$ (3) $\frac{10}{3}$ (4) $\frac{3}{5}$
4. The radius of the circle $3x^2 + by^2 + 4bx - 6by + b^2 = 0$ is
   (1) 1 (2) 3 (3) $\sqrt{10}$ (4) $\sqrt{11}$
5. The centre of the circle inscribed in a square formed by the lines $x^2 - 8x - 12 = 0$ and $y^2 - 14y + 45 = 0$ is
   (1) (4,7) (2) (7,4) (3) (9,4) (4) (4,9)
6. If $P(x, y)$ be any point on $16x^2 + 25y^2 = 400$ with foci $F_1(3,0)$ and $F_2(-3,0)$ then $PF_1 + PF_2$ is
   (1) 8 (2) 6 (3) 10 (4) 12
7. The radius of the circle passing through the point (6,2) two of whose diameter are $x + y = 6$ and $x + 2y = 4$ is
   (1) 10 (2) $2\sqrt{5}$ (3) 6 (4) 4
8. The area of quadrilateral formed with foci of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ is
   (1) $4(a^2 + b^2)$ (2) $2(a^2 + b^2)$ (3) $a^2 + b^2$ (4) $\frac{1}{2}(a^2 + b^2)$
9. If the normals of the parabola $y^2 = 4x$ drawn at the end points of its latus rectum are tangents to the circle $(x - 3)^2 + (y + 2)^2 = r^2$, then the value of r^2 is
   (1) 2 (2) 3 (3) 1 (4) 4
10. If $x + y = k$ is a normal to the parabola $y^2 = 12x$, then the value of k is
    (1) 3 (2) -1 (3) 1 (4) 9

11. Tangents are drawn to the hyperbola $\frac{x^2}{9}-\frac{y^2}{4}=1$ parallel to the straight line $2x-y=1$. One of the points of contact of tangents on the hyperbola is

(1) $\left(\frac{9}{2\sqrt{2}},\frac{-1}{\sqrt{2}}\right)$ (2) $\left(\frac{-9}{2\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ (3) $\left(\frac{9}{2\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ (4) $(3\sqrt{3},-2\sqrt{2})$

12. Let C be the circle with centre at $(1,1)$ and radius $=1$. If T is the circle centered at $(0,y)$ passing through the origin and touching the circle C externally, then the radius of T is equal

(1) $\frac{\sqrt{3}}{\sqrt{2}}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{1}{2}$ (4) $\frac{1}{4}$

13. Area of the greatest rectangle inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

(1) $2ab$ (2) ab (3) $\sqrt{ab}$ (4) $\frac{a}{b}$

14. An ellipse has OB as semi minor axes, F and F' its foct and the angle FBF' is a right angle. Then the eccentricity of the ellipse is

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$ (3) $\frac{1}{4}$ (4) $\frac{1}{\sqrt{3}}$

15. The eccentricity of the ellipse $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{3\sqrt{2}}$ (4) $\frac{1}{\sqrt{3}}$

16. If the two tangents drawn from a point P to the parabola $y^2=4x$ are at right angles then the locus of P is

(1) $2x+1=0$ (2) $x=-1$ (3) $2x-1=0$ (4) $x=1$

17. The circle passing through $(1,-2)$ and touching the axis of x at $(3,0)$ passing through the point

(1) $(-5,2)$ (2) $(2,-5)$ (3) $(5,-2)$ (4) $(-2,5)$

18. The locus of a point whose distance from $(-2,0)$ is $\frac{2}{3}$ times its distance from the line $x=\frac{-9}{2}$ is

(1) a parabola (2) a hyperbola (3) an ellipse (4) a circle

19. The values of m for which the line $y=mx+2\sqrt{5}$ touches the hyperbola $16x^2-9y^2=144$ are the roots of $x^2-(a+b)x-4=0$, then the value of $(a+b)$ is

(1) 2 (2) 4 (3) 0 (4) -2

20. If the coordinates at one end of a diameter of the circle $x^2+y^2-8x-4y+c=0$ are $(11,2)$. the coordinates of the other end are

(1) $(-5,2)$ (2) $(2,-5)$ (3) $(5,-2)$ (4) $(-2,5)$

PART-B

Answer the following questions: **(8× 2 = 16)**

21. 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.

22. Find the equation of the tangent and normal to the circle $x^2+y^2-6x+6y-8=0$ at $(2,2)$.

23. If $y = 2\sqrt{2}x + c$ is a tangent to the circle $x^2 + y^2 = 16$, find the value of c.
24. The orbit of Halley's Comet is an ellipse 36.18 astronomical units long and by 9.12 astronomical units wide. Find its eccentricity.
25. Find the equation of the parabola which passes through $(2, -3)$ and symmetric about y-axis.
26. Find the equation of the tangent at $t = 2$ to the parabola $y^2 = 8x$.
27. The parabolic communication antenna has a focus at 2 m distance from the vertex of the antenna. Find the width of the antenna 3 m from the vertex.
28. 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?

PART-C

Answer the following questions: **$(8\times 3 = 24)$**

29. Find the equation of the circle described on the chord $3x + y + 5 = 0$ of the circle $x^2 + y^2 = 16$ as diameter.
30. Find the equation of the circle through the points $(3,0)$, $(-3,0)$, and $(0,3)$.
31. Find the length of Latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
32. Show that the absolute value of difference of the focal distances of any point P on the hyperbola is the length of its transverse axis.
33. Find the equations of the two tangents that can be drawn from $(5,2)$ to the ellipse $2x^2 + 7y^2 = 14$
34. Find the equations of tangents to the hyperbola $\frac{x^2}{16} - \frac{y^2}{64} = 1$ which are parallel to $10x - 3y + 9 = 0$.
35. Prove that the point of intersection of the tangents at ' t_1 ' and ' t_2 ' on the parabola $y^2 = 4ax$ is $[at_1t_2, a(t_1 + t_2)]$.
36. A rod of length 1.2 m moves with its ends always touching the coordinate axes. The locus of 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

PART-D

Answer the following questions: **$(8\times 5 = 40)$**

37. Find the equation of the circle passing through the points $(1,1)$, $(2,-1)$, and $(3,2)$.
38. Find the centre, foci, and eccentricity of the hyperbola $11x^2 - 25y^2 - 44x + 50y - 256 = 0$
39. Find the equations of the tangent and normal to hyperbola $12x^2 - 9y^2 = 108$ at $\theta = \frac{\pi}{3}$.
40. If the normal at the point ' t_1 ' on the parabola $y^2 = 4ax$ meets the parabola again at the point ' t_2, then prove that $t_2 = -\left(t_1 + \frac{2}{t_1}\right)$.

41. The maximum and minimum distances of the Earth from the Sun respectively are 152×10^6 km 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.

42. 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.

43. 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 12 m away from the starting point. Find the angle of projection.

44. 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 16 m, 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?

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