PART – C
Level – 1 Questions

1. Find the radius of curvature for the curve $x^3 + y^3 = 3axy$.

2. Find the radius of curvature for the curve $\sqrt{\dfrac{x}{a}} + \sqrt{\dfrac{y}{b}} = 1$ at any point (x, y) .

3. Find ρ for the curve $y^2 = x^3 + 8$ at $(-2,0)$.

4. Show that the radius of curvature of the hypocycloid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ at any point (a, b) is $3(abc)^{\frac{1}{3}}$.

5. Find the radius of curvature of the curve $x = a \cos \theta$, $y = a \sin \theta$ at $= \dfrac{\pi}{4}$.

6. Find the radius of curvature at $(a, 0)$ on the curve $y^2 = a^3 - x^3$.

7. Find ρ for the curve $x = 6t^2 - 3t^4$, $y = 8t^3$ at the point .

Level – 2 Questions

8. Find the centre and circle of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $\left(\dfrac{a}{4}, \dfrac{a}{4}\right)$.

9. Find the circle of curvature of the curve $x^3 + y^3 = 3axy$ at the point $\left(\dfrac{3a}{2}, \dfrac{3a}{2}\right)$.

10. Find the envelope of the family of straight lines $x \cos \theta + y \sin \theta = a \sec \theta$, θ being the parameter.

11. Find the centre of curvature of $y = x^2$ at the origin.

12. Find the circle of curvature at the point $(1,1)$ on the curve $x^3 + y^3 = 2$.

13. Find the equation of the circle of curvature of the parabola $y^2 = 12x$ at the point $(3,6)$.

14. Show that the radius of curvature ρ at any point (x, y) on the curve $y = \dfrac{ax}{a+x}$ satisfies $\left(\dfrac{2\rho}{a}\right)^{\frac{2}{3}} = \left(\dfrac{x}{y}\right)^{\frac{2}{3}} + \left(\dfrac{y}{x}\right)^{\frac{2}{3}}$.

15. Find the radius of curvature of the curve $xy^2 = a^3 - x^3$ at $(a, 0)$.

Level – 3 Questions

16. Find the evolute of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.

17. Find the evolute of the rectangular hyperbola $= c^2$.

18. Show that the evolute of the cycloid $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ is another cycloid.

19. Find the evolute of the hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$.

20. Find the equation of the evolute of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.

21. Find the equation of the evolute of the parabola $y^2 = 4ax$.

22. Show that the evolute of the curve $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ is a circle.

23. Obtain the evolute of the parabola $x^2 = 4ay$