



SNS COLLEGE OF ENGINEERING, COIMBATORE

Kurumbapalayam(Po), Coimbatore – 641 107

Accredited by NAAC-UGC with ‘A’ Grade

Approved by AICTE & Affiliated to Anna University, Chennai

19MA101 – ENGINEERING MATHEMATICS I

IAE II – QUESTION BANK

UNIT – II

PART A

1. Define cauchy’s integral test.
2. Define Alternating Series: Leibnitz’s Rule.
3. Give an example for conditionally convergent series
4. Using integral test determine the convergence of $1 + \frac{1}{3} + \frac{1}{5} + \dots + \frac{1}{2n-1} + \dots$
5. Apply Cauchy’s integral test to show that the harmonic series $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} + \dots$ is divergent.
6. Test the convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{\sqrt{n}}$
7. Test whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2n-1}$ is convergent or not

PART B

1. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{\cos n\pi}{n^2+1}$
2. Discuss the convergence and divergence of the following series
 $\frac{1}{2^3} - \frac{1}{3^3} (1+2) + \frac{1}{4^3} (1+2+3) - \frac{1}{5^3} (1+2+3+4) \dots$
3. Test for convergence of the series $\frac{x}{1+x} - \frac{x^2}{1+x^2} + \frac{x^3}{1+x^3} - \frac{x^4}{1+x^4} + \dots$ ($0 < x < 1$).
4. Test the convergence of the series $\frac{1}{1.2} - \frac{1}{3.4} + \frac{1}{5.6} - \frac{1}{7.8} \dots$
5. Test the absolute or conditional convergence of the following series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2n-1}$
6. Test the absolute convergence or convergence of the series $\frac{2}{3} - \frac{3}{4} \left(\frac{1}{2}\right) + \frac{4}{5} \left(\frac{1}{3}\right) - \dots$
7. Test the absolute convergence of the series $1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$
8. Test the absolute or conditional convergence of the following series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{n^2+1}$
9. Show that $\sum_{n=1}^{\infty} \frac{1}{n^2+1}$ converges by using integral test.
10. Find the nature of the series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}$ by Cauchy’s integral test.

11. Examine the convergence of the series $1 + \frac{1}{4^{2/3}} + \frac{1}{9^{2/3}} + \frac{1}{16^{2/3}} + \dots$
12. Using integral test, show that $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges

UNIT-III

PART A

1. Find the radius of curvature for $y=e^x$ at the point where it cuts the y-axis.
2. Define circle of curvature.
3. Find the centre of curvature for $y=x^2$ at the origin.
4. Find the curvature of the curve $2x^2+2y^2+x-2y+1=0$.
5. Find the radius of curvature of the curve $x^2+y^2-4x+2y-8=0$.
6. What is the curvature of the circle $(x-1)^2+(y+2)^2=16$ at any point on it?
7. Write down the formula for Radius of curvature in terms of parametric co-ordinate system.
8. Define involutes and evolutes.
9. Find the envelope of the family of straight lines $y = mx + \frac{a}{m}$, where m is a parameter.
10. Find the envelope of the family of straight lines $y = mx + \frac{1}{m}$, where m is a parameter.
11. Find the envelope of the straight lines $x\cos\theta+y\sin\theta=\alpha$ where θ is the parameter.
12. Find the envelope of the family of circles $c(x-\alpha)^2+y^2=r^2$, α being the parameter.

PART B.

1. Find the radius of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $\left(\frac{a}{4}, \frac{a}{4}\right)$.
2. Find the radius of curvature at the point (0,c) on the curve $y = c \cosh \frac{x}{c}$.
3. Find the radius and centre of curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the curve $x^3+y^3=3axy$.
4. Find the radius and centre of curvature of the curve $y= x^3-6x^2+3x+1$ at the point (1, -1).
5. Find the equation of the circle of curvature at $\left(\frac{a}{4}, \frac{a}{4}\right)$ on $\sqrt{x} + \sqrt{y} = \sqrt{a}$.
6. Find the equation of the circle of curvature of the parabola $y^2 = 12x$ at the point (3,6).
7. Find the equation of the circle of curvature of the rectangular hyperbola $xy=12$ at the point (3,4).
8. Find the equation of the circle of curvature of $\frac{x^2}{4} + \frac{y^2}{9} = 2$ at (2,3).

9. Find the equation of the evolute of the parabola $y^2 = 4ax$.
10. Find the evolute of the parabola $x^2 = 4ay$.
11. Find the evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.
12. Find the evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
13. Find the envelope of straight line $\frac{x}{a} + \frac{y}{b} = 1$, where a and b be the parameters that are connected by the relation $a+b=c$.
14. Find the envelope of $\frac{x}{a} + \frac{y}{b} = 1$, where a and b be the parameters that are connected by the relation $a^2+b^2=c^2$, c being constant.
15. Find the envelope of straight line $\frac{x}{a} + \frac{y}{b} = 1$, where a and b be the parameters are connected by the relation $a^n+b^n=c^n$.
16. Find the envelope of the system of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where a and b are connected by the relation $a^2+b^2=c^2$.