

PART - A

1. Test the series $\sum_{n=0}^{\infty} \frac{1}{3^n}$ for convergence
2. State Comparison tests for convergence
3. Using integral test, determine the convergence of $1 + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \dots + \frac{1}{2n-1} + \dots$
4. Using comparison test, prove that the series $\frac{1}{1.3} + \frac{2}{3.5} + \frac{3}{5.7} + \dots$ is divergent.
5. Define Conditional convergence with example
6. Test the convergence of the series $5 - 4 - 1 + 5 - 4 - 1 + 5 - 4 - 1 + \dots$
7. Test the convergence of the series $\frac{1}{1.2} - \frac{1}{3.4} + \frac{1}{7.8} - \dots$
8. Prove that $\frac{\sin x}{1^3} - \frac{\sin 2x}{2^3} + \frac{\sin 3x}{3^3} - \dots$ converges absolutely.

PART B

- 1(a) Test the convergence of the series $\frac{6}{1.3.5} + \frac{8}{3.5.7} + \frac{10}{5.7.9} + \dots$
- (b) Discuss the convergence of the series $\sum_{n=2}^{\infty} \frac{1}{n (\log n)^p}$, ($p > 0$)
- 2(a) Discuss the convergence and divergence of the series $\sum_{n=1}^{\infty} \frac{1.3.5 \dots (2n-1)}{2.4.6 \dots 2n} x^{n-1}$, $x > 0$
- (b) Test the convergence of the series $\sum_{n=0}^{\infty} n e^{-n^2}$

3(a) Test the convergence of the series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} \dots$ if $x < 1$

(b) Test the convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} (\sqrt{n+1} - \sqrt{n})$

4(a) Determine the convergence of an alternating series $\sum_{n=1}^{\infty} \frac{\cos n\pi}{n^2 + 1}$ for absolute and conditional convergence.

(b) Examine the series $1 - \frac{x^2}{2^2} + \frac{x^4}{2^2 4^2} - \frac{x^6}{2^2 4^2 6^2} + \dots$ for absolute convergence