

**GOVERNMENT ENGINEERING COLLEGE
BHUJ**

B.E. 1st SEMESTER

Subject: MATHS–1 (BE01R00041)

TERM WORK ASSIGNMENT – 7

(Infinite Series: Comparison, Ratio, Root & Integral Tests)

Q1. p-Series & Integral Test

Test convergence:

(a) $\sum_{n=1}^{\infty} \frac{1}{n^{1.2}}$.

(b) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$.

(c) $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n} \ln n}$.

Q2. Direct Comparison & Limit Comparison Tests

Test convergence:

(a) $\sum_{n=1}^{\infty} \frac{5n + 3}{n^3 + 4}$.

(b) $\sum_{n=1}^{\infty} \frac{\sqrt{n} + \sin n}{n^{3/2}}$.

(c) $\sum_{n=1}^{\infty} \frac{2n^3 + 3}{7n^3 - 9n + 4}$.

(d) $\sum_{n=2}^{\infty} \frac{\ln(n + 1)}{n^2}$.

Q3. Ratio Test

Determine convergence:

(a) $\sum_{n=1}^{\infty} \frac{n!}{4^n}$.

(b) $\sum_{n=1}^{\infty} \frac{3^n}{n!}$.

(c) $\sum_{n=1}^{\infty} \frac{(2n)!}{n^{2n}}$.

Q4. Root Test

Use the root test on:

(a) $\sum_{n=1}^{\infty} \left(\frac{n}{n+5} \right)^n$.

(b) $\sum_{n=1}^{\infty} \left(1 + \frac{2}{n} \right)^n$.

(c) $\sum_{n=1}^{\infty} \frac{n}{(3 + \sin n)^n}$.

Q5. Alternating Series & Absolute Convergence

(a) Test absolute/conditional convergence of:

$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n(\ln n)}.$$

(b) Determine convergence of:

$$\sum_{n=1}^{\infty} (-1)^n \frac{\ln n}{n^{3/2}}.$$

(c) Create one alternating series that converges conditionally but not absolutely.

Q6. Mixed Problems

Test convergence:

(a) $\sum_{n=1}^{\infty} \frac{2^n}{n^3}$.

(b) $\sum_{n=1}^{\infty} \frac{n^4}{5^n}$.

(c) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)(\ln(\ln n))}$.