Assignment (Unit-I)

Subject Name: CALCULUS **Subject Code: BMC-101**
Teacher's Name: Dr Raghwendra Singh **Class/Branch: B.Sc(HONS)**

---

1. Find the formula for the n^{th} term of the sequence and what can you say about its convergence.

a) $1, -\frac{1}{4}, \frac{1}{9}, -\frac{1}{16}, \frac{1}{25}, \ldots$

b) $\frac{1}{9}, \frac{2}{12}, \frac{2^2}{15} \cdot \frac{2^3}{18}, \ldots$

c) $\frac{100}{2}, -\frac{100^2}{6}, \frac{100^3}{24}, -\frac{100^4}{120}, \ldots$

2. Determine whether the sequence $\{a_n\}$ is monotonic, bounded and convergent, where

(a) $a_n = \frac{3n+1}{n+1}$, (b) $a_n = \frac{(2n+3)!}{(n+1)!}$ (c) $a_n = \frac{n!}{n^n}$

3 Discuss the convergence of the sequence $\{a_n\}$ where

a) $a_n = \frac{n+1}{n}$

b) $a_n = \frac{n}{n^2+1}$

c) $a_n = 1 + \frac{1}{3} + \frac{1}{3^2} + \ldots \frac{1}{3^n}$

4 Check the following positive term series for convergence and divergence

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

b) $\sum_{n=1}^{\infty} \frac{n+2^n}{n^2 \cdot 2^n}$

c) $\sum_{n=1}^{\infty} \frac{1 \cdot 3 \ldots (2n-1)}{4^n 2^n n!}$

d) $\sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \ldots (2n-1)}{2 \cdot 4 \cdot 6 \ldots 2n(3^n+1)}$

5 State Leibniz's test of convergence for alternating series of real numbers.

Assignment (Unit-I)

Subject Name: CALCULUS **Subject Code: BMC-101**
Teacher's Name: Dr Raghwendra Singh **Class/Branch: B.Sc(HONS)**

---

6 Using integral test show that $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is convergent when $p > 1$ and diverges for $p \leq 1$.

7 Define absolute and conditional convergence of a series with arbitrary terms.

8 Check the following series for absolutely or conditionally convergence,

a) $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n^2}$

b) $\sum_{n=1}^{\infty} \frac{\sin n\alpha}{n^2}$

c) $\sum_{n=1}^{\infty} \frac{(-1)^n (n+2)}{2^n + 5}$

d) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$

e) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\log(1+n)}$