# Shri S. H. Kelkar College of Arts, Commerce and Science, Devgad

## S.Y.BSC SEMESTER-III Examination-October 2023

**Course: Mathematics Paper-I** | **Course Code: USMT301**

**Maximum marks: 75** | **Duration: 2 ½Hrs**

**Instructions:**

**All questions are compulsory and carry equal marks**

**Figures to the right indicate full marks**

**Q.1) Attempt any four of the following** **20**

a) Explain infinite series and its convergence.
b) Define alternating series and state Leibnitz Theorem.
c) Prove that if $\sum_{n=1}^{\infty} a_n$ is convergent, then $\lim_{n\to\infty} a_n = 0$
d) Discuss the convergence of $\sum_{n=1}^{\infty} \frac{7}{2n^2+9n+8}$.
e) Discuss the absolute convergence of series $1 + \frac{1}{3} + \frac{1}{7} + \frac{1}{15} + \cdots$

**Q.2) Attempt any four of the following** **20**

a) Explain Upper, Lower Riemann sum of bounded function and Partition
b) Let $f:[0,1] \to R\ defined\ by\ f(x) = 1 - x, P = \{0, ¼, ½, ¾, 1\}$ Find L (P, f) and U(P, f)
c) Define Upper and Lower integral of f and state its properties
d) Let $f:[a,b] \to R$ be bounded function. Let P be partition then L(P, f)≤ U(P, f)
e) Prove that the constant function is Riemann Integrable.

**Q.3) Attempt any four of the following** **20**

a) States properties of β function
b) Examine the convergence of $\int_2^{\infty} \frac{1}{x^3} dx$
c) Prove that if $a > 0, \int_a^{\infty} x^p dx$ is convergent for all P<-1 and divergent for P≥ $-1$
d) Prove that $\Gamma(n+1) = n!$
e) Solve $\int_{-1}^{1} \frac{1}{x^2} dx$

**Q.4) Attempt any three of the following** **15**

a) State P-series test and limit comparison test
b) Define absolute convergence and conditional convergence of the series
c) Explain norm of partition with suitable example
d) Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x}}$