National University

Of Computer & Emerging Sciences-CFD Campus

MT1006 Differential Equations

Assignment # 1

Submission Date: Monday, Sep 11, 2023

Note: There will be a quiz for the evaluation of this assignment.

Q1. a) Determine the convergence or divergence of the following sequences.

i) $n\sin\frac{1}{n}$ ii) $\frac{\ln(n^2)}{n}$ iii) $\frac{5^n+(-1)^n}{5^{n+1}+(-1)^{n+1}}$ iv) $\frac{(n-4)!}{(n-1)!}$ v) $\frac{2^n}{(2n)!}$

b) Apply the nth-term test for divergence on the following series.

ii) $\sum_{n=1}^{\infty} n\sin\frac{1}{n}$ ii) $\sum_{n=2}^{\infty}\frac{\ln(n^2)}{n}$ iii) $\sum_{n=1}^{\infty}\frac{5^n+(-1)^n}{5^{n+1}+(-1)^{n+1}}$

iv) $\sum_{n=2}^{\infty}\frac{(n-4)!}{(n-1)!}$ v) $\sum_{n=1}^{\infty}\frac{2^n}{(2n)!}$

Q2. Find sum of the given series if possible.

i) $\sum_{n=1}^{\infty}\frac{1}{9n^2+3n-2}$ ii) $\sum_{n=1}^{\infty} ln\left(\frac{n}{n+1}\right)$ iii) $\sum_{n=1}^{\infty}\frac{\sqrt{n+1}-\sqrt{n}}{\sqrt{n^2+n}}$

iv) $\sum_{n=1}^{\infty}\frac{40n}{(2n-1)^2(2n+1)^2}$ v) $(1+1)+\left(\frac{1}{2}+\frac{1}{2^{\frac{2}{3}}}\right)+\left(\frac{1}{4}+\frac{1}{3^{\frac{2}{3}}}\right)+\left(\frac{1}{8}+\frac{1}{4^{\frac{2}{3}}}\right)+\ldots$

vi) $\sum_{n=1}^{\infty}\frac{e^{2n}+e^{-2n}}{e^{n}+e^{-n}}$

Q3. Apply integral Test to determine the convergence or divergence of the given series.

i) $\sum_{n=1}^{\infty} ne^{-n^2}$ ii) $\sum_{n=1}^{\infty}\frac{e^n}{1+e^{2n}}$ iii) $\sum_{n=1}^{\infty}\frac{1}{\sqrt{n}\left(\sqrt{n}+1\right)}$ iv) $\sum_{n=2}^{\infty}\frac{\sqrt{n}}{\ln n}$