## Note: All questions carry equal Marks.

Q1. Determine whether the sequence $\left\{\sqrt{n^{4}+4 n^{2}}-n^{2}\right\}$ converges or diverges and if it converges, find its limit.

Q2. Find the sum of the series: $\quad \sum_{n=3}^{\infty}\left[\frac{2^{3 n}}{3^{2 n}}+\frac{1}{n^{2}-3 n+2}\right]$.

Q3. Determine whether the following series is absolutely convergent, conditionally convergent or divergent: $\sum_{n=2}^{\infty} \frac{(-1)^{n}}{n \ln (n)}$.

Q4. Find the interval of convergence and the radius of convergence of the power series:

$$
\sum_{n=1}^{\infty} \frac{2^{n}(x-e)^{n}}{n}
$$

Q5. Find the MacLaurin series for the function $f(x)=\tan ^{-1}(x)$ up to three non-zero terms and approximate the value of the integral

$$
\int_{0}^{0.1} \tan ^{-1}\left(x^{2}\right) d x
$$

