

**M-203**

**Second Semester 1440/1441**

**Department of Mathematics, College of Science**

**First Home Assignment (Max. Marks 25)**

**All Questions Carry Equal Marks**

Q#1. Determine whether the sequence  $\left\{ \frac{(n+1)!}{n! - (n+1)!} \right\}_{n=1}^{\infty}$  converges or diverges and if it converges, find the limit.

Q#2. Find the sum of the following series :  $\sum_{n=1}^{\infty} \frac{2n+1}{(n^2+n)^2}$

Q#3. Determine whether the series  $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{\sqrt{2n+1}}$  is absolutely convergent or conditionally convergent or divergent.

Q#4. Find the radius of convergence and the interval of convergence for the power series  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n 5^n} (x - 5)^n$

Q#5. Find the Maclaurin series for  $\tan^{-1}x$  and use its first two non-zero terms to approximate the integral

$\int_0^{0.5} x \tan^{-1}x \, dx$  and estimate the error in this approximation.