Jaypee University of Information Technology, Waknaghat
Test-1 Examination, March 2023
B.Tech - II Semester (CSE/IT/ECE/ECM/CE/CEC)

Course Code/Credits: 18B11MA211/4
Course Title: Engineering Mathematics-II
Course Instructors: RAD, KAS, NKT, SST

Max. Marks: 15

Max. Time: 1 hour

Instructions: All questions are compulsory. Marks are indicated against each question.

1. (a) Does the sequence whose n^{th} term is $u_n = \left(\dfrac{n+1}{n-1}\right)^n$ converge? If yes, find the number to which it converges. (1 Marks) [CO-1]

   (b) Can the integral test be applied on the series $\sum\limits_{n=1}^{\infty} \dfrac{-2}{n+1}$? Justify your answer. If yes, determine the convergence/divergence of the series. (2 Marks) [CO-1]

2. Test the convergence of the infinite series: (3 Marks) [CO-1]

$$\left(\frac{1}{3}\right)^2 + \left(\frac{1}{3}\cdot\frac{2}{5}\right)^2 + \left(\frac{1}{3}\cdot\frac{2}{5}\cdot\frac{3}{7}\right)^2 + \cdots$$

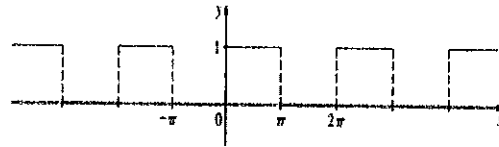3. Test the series for (a) convergence and (b) absolute convergence: (3 Marks) [CO-1]

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

4. Determine the *radius of convergence* of the following series: (2 Marks) [CO-1]

$$\sum_{n=0}^{\infty} \frac{n(x+2)^n}{3^{n+1}}$$

5. Consider the periodic function and its graph as shown: (4 Marks) [CO-1]

$$f(x) = \begin{cases} 0 , & -\pi < x < 0 \\ 1 , & 0 < x < \pi \end{cases}$$

   (a) Obtain Fourier series expansion of the function $f(x) = f(x+2\pi)$.

   (b) Deduce that $1 - \dfrac{1}{3} + \dfrac{1}{5} - \dfrac{1}{7} + \cdots = \dfrac{\pi}{4}$.

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