ABES Engineering College, Ghaziabad

Department of Applied Sciences & Humanities

Session: 2023-24 **Semester: II** **Section: Common to All**

Course Code: BAS203 **Course Name: Engineering Mathematics II**

Assignment 1

Date of Assignment: **Date of submission:**

S.No.	KL, CO	Question	Marks
1	K_3,CO3	Discuss the convergence of the sequence $\{a_n\}$, where **(i)** $a_n = \frac{n+1}{n}$ (ii) $a_n = 1+\frac{1}{3}+\frac{1}{3^2}+\ldots\ldots\ldots\ldots\frac{1}{3^n}$ (iii) $< a_n >=< 2, 2^2, 2^3, 2^4, \ldots\ldots\ldots >$	2+2+1
2	K_3,CO3	Test for convergence or divergence of the series whose n^{th} term is $\frac{\sqrt{n+1}-\sqrt{n}}{n^p}$	5
3	K_3,CO3	Test for convergence or divergence of the series whose n^{th} term is $\sqrt{(n^2+1)}-\sqrt{(n^2-1)}$	5
4	K_3,CO3	Test for convergence or divergence of the series $\frac{1}{1.2.3}+\frac{3}{4.5.6}+\frac{5}{7.8.9}+\ldots\ldots$	5
5	K_3,CO3	Test for convergence or divergence of the series $1+\frac{1}{2}.\frac{x^2}{4}+\frac{1.3.5}{2.4.6}.\frac{x^4}{8}+\frac{1.3.5.7.9}{2.4.6.8.10}.\frac{x^6}{12}+\cdots$	5
6	K_3,CO3	Expand $f(x) = xsinx, 0 < x < 2\pi$ as a Fourier Series.	5
7	K_3,CO3	Find the Fourier series of periodic function $f(x)$with period 2π defined as follows:$f(x) = \begin{cases} 0, & -\pi \le x \le 0 \\ x, & 0 \le x \le \pi \end{cases}$. Hence prove that $\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$ AKTU 2013,2014	5
8	K_3,CO3	Obtain the Fourier series for the function f(x) = $\begin{cases} \pi x & 0 \le x \le 1 \\ \pi(2-x) & 1 \le x \le 2 \end{cases}$ AKTU 2022	5
9	K_3,CO3	Find the Half range cosine series for the function $f(x) = (x-1)^2$ *in the interval* $0 < x < 1$. Hence show that (i) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots\ldots\ldots = \frac{\pi^2}{6}$ (ii) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\ldots\ldots = \frac{\pi^2}{12}$ (iii) $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}\ldots\ldots\ldots = \frac{\pi^2}{8}$	5

10	K_3,CO3	Obtain the Half range sine series for the function f(t) = $\begin{cases} t & 0 < t < 2 \\ 4-t & 2 < t < 4 \end{cases}$	AKTU 2019	5

Answers

1. **(i) Convergent (ii) Convergent (iii) Divergent**
2. **Convergent if $p > \frac{1}{2}$ and Divergent if $p \leq \frac{1}{2}$**
3. **Divergent**
4. **Convergent**
5. **Convergent if $x^2 \leq 1$ and Divergent if $x^2 > 1$**
6. $f(x) = -1 - \frac{1}{2}cosx + \pi sinx + \sum_{n=2}^{\infty} \frac{2}{n^2-1} cosnx$
7. $f(x) = \frac{\pi}{4} - \frac{2}{\pi}\sum_{n=1(n\ is\ odd)}^{\infty} \frac{1}{n^2} cosnx - \sum_{n=1}^{\infty} \frac{(-1)^n}{n} sinnx$
8. $f(x) = \frac{\pi}{2} - \frac{4}{\pi}(\frac{cos\ \pi x}{1^2} + \frac{cos\ 3\pi x}{3^2} + \frac{cos\ 5\pi x}{5^2} + \cdots..)$
9. $f(x) = \frac{1}{3} + \frac{4}{\pi^2}(cos\pi x + \frac{cos2\pi x}{2^2} + \frac{cos3\pi x}{3^2} + \cdots \ldots \ldots..$
10. $f(t) = \frac{16}{\pi^2}\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)^2} sin\ \frac{(2n+1)\pi t}{4}$