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

Course Code: BAS-203 **Course Name:** Engg. Maths-II

Tutorial-3 (Series and Sequence)

S.No.	KL, CO	Question
1	K3, CO3	Expand $f(x) = x\ sinx, 0 < x < 2\pi$ as a Fourier series. **AKTU 2015, 2022**
2	K3, CO3	Express $f(x) = |x|, -\pi < x < \pi$, as Fourier series. Hence Show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \ldots \ldots = \frac{\pi^2}{8}$. **AKTU 2017-18**
3	K3, CO3	Obtain Fourier series for the function f(x) given by $f(x) = \begin{cases} 1 + \frac{2x}{\pi} & -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi} & 0 \le x \le \pi \end{cases}$. Hence, deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \ldots \ldots = \frac{\pi^2}{8}$. **AKTU 2021-22**
4	K3, CO3	Find the Fourier expansion for the function $f(x) = x - x^3$ in the interval (-1,1). **AKTU 2015-2016**
5	K3, CO3	Find the Fourier half –range cosine series of the function $f(t) = \begin{cases} 2t & 0 < t < 1 \\ 2(2-t) & 1 < t < 2 \end{cases}$. **AKTU 2018-19**
6	K3, CO3	**Test the convergence of the following infinite series:** $\frac{1}{\sqrt{2}-1} + \frac{1}{\sqrt{3}-1} + \frac{1}{\sqrt{4}-1} + \frac{1}{\sqrt{5}-1} + \cdots \ldots$
7	K3, CO3	**Test the series whose nth term is $\frac{1}{n} \sin \frac{1}{n}$. AKTU 2021-22**
8	K3, CO3	**Test the convergence of the series**

		$\dfrac{1}{1.2.3} + \dfrac{x}{4.5.6} + \dfrac{x^2}{7.8.9} \ \ldots \ldots \ldots$ AKTU 2022-23
9	K3, CO3	**Test the convergence of the series** $1 + \dfrac{x}{2} + \dfrac{1.3}{2.4}x^2 + \dfrac{1.3.5}{2.4.6}x^3 + \cdots \ldots \ldots, x > 0.$
10	K3, CO3	**Test the convergence of the series** $1 + \dfrac{x}{2} + \dfrac{2!\,x^2}{3^2} + \dfrac{3!\,x^3}{4^3} + \cdots \ldots \ldots.$

Answers:

1. $f(x) = 1 - \dfrac{1}{2}cosx + \pi sinx + \sum_{n=2}^{\infty}\dfrac{2}{n^2-1}cosx.$

3. $f(x) = \dfrac{4}{\pi^2}\sum_{n=1}^{\infty}[1 - (-1)^n]\dfrac{cosnx}{n^2}$

4. $f(x) = \dfrac{12}{\pi^3}\left(sin\pi x - \dfrac{sin2\pi x}{2^3} + \dfrac{sin3\pi x}{3^3} - \cdots \ldots \ldots \right).$

5. $f(t) = 1 + \dfrac{8}{\pi^2}\sum_{n=1}^{\infty}\dfrac{1}{n^2}\left(2cos\dfrac{n\pi}{2} - 1 - cosn\pi\right)cos\dfrac{n\pi t}{2}$

6. **Convergent**

7. **Convergent**

8. **Convergent if x≤ 1 and divergent if x>1.**

9. **Convergent if x<1 and divergent if x≥ 1.**

10. **Convergent if x<e and divergent if x≥ e .**