PART B Questions

1. State Dirichlet condition's for a given function to expand in Fourier series.

2. Find a_1 for the periodic function $f(x) = \begin{cases} \sin x, 0 < x < \pi \\ 0, \pi < x < 2\pi \end{cases}$

3. Find a_0 for the periodic function $f(x) = e^{-x}, 0 < x < 2\pi$.

4. Find a_n for the Fourier series of periodicity 3 for $f(x) = 2x - x^2$ in $0 < x < 3$

5. Find half –range cosine series for $f(x) = x, 0 < x < \pi$

PART C Questions

6. Find the Fourier series to represent $(x - x^2)$ in the interval $[-\pi, \pi]$. Deduce the value of
$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \ldots\ldots$$

7. Obtain the Fourier series expansion for $f(x) = x^2 in -\pi < x < \pi$ and hence the sum of the series $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \ldots\ldots$

8. If $f(x) = \begin{cases} \sin x, 0 < x < \dfrac{\pi}{4} \\ \cos x, \dfrac{\pi}{4} < x < \dfrac{\pi}{2} \end{cases}$ .Express f(x) in a series of sines.

9. Find the Fourier series for $f(x) = |\cos x| in -\pi < x < \pi$ of periodicity 2π.

10. Find the Fourier series for $f(x) = |\sin x| in -\pi < x < \pi$ of periodicity 2π.

Tutorial Sheet-1
Answers
Part-A

1. State any three condition

2. $a_1 = 0$

3. $a_0 = \dfrac{1 - e^{-2\pi}}{\pi}$.

4. $a_n = \dfrac{-9}{n^2\pi^2}$

5. $a_n = \begin{cases} \dfrac{-4}{\pi n^2}; & if \ \ n \ is \ \ odd \\ 0 & if \ n \ is \ even \end{cases}$

Part - B

6. $f(x) = \dfrac{-\pi^2}{3} + \sum\limits_{n=1}^{\infty} \dfrac{-4(-1)^n}{n^2}\cos nx + \sum\limits_{n=1}^{\infty} \dfrac{-2(-1)^n}{n}\sin nx \ and \ \dfrac{1}{1^2} - \dfrac{1}{2^2} + \dfrac{1}{3^2}...... = \dfrac{\pi^2}{3}$

7. $f(x) = \dfrac{\pi^2}{3} + 4\sum\limits_{n=1}^{\infty} \dfrac{(-1)^n}{n^2}\cos nx \ and \ \dfrac{1}{1^4} + \dfrac{1}{2^4} + \dfrac{1}{3^4} + ...\infty = \dfrac{\pi^4}{90}$

8. $f(x) = \dfrac{4\sqrt{2}}{\pi}\left\{ \dfrac{\sin 2x}{1.3} - \dfrac{\sin 6x}{5.7} + \dfrac{\sin 10x}{9.11} - ... \right\}$

9. $f(x) = \dfrac{2}{\pi} - \dfrac{4}{\pi}\sum\limits_{n=2}^{\infty} \dfrac{1}{n^2 - 1}\cos\left(\dfrac{n\pi}{2}\right)\cos nx$

10. $f(x) = \dfrac{2}{\pi} - \dfrac{4}{\pi}\sum\limits_{n=1}^{\infty} \dfrac{1}{(4n^2 - 1)}\cos 2nx$