SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE – 35

19MAT 201 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

UNIT – I

FOURIER SERIES

PART A

1. Write Dirichlet's conditions.

2. Find a_0 for $f(x) = \frac{\pi - x}{2}$ in $(0, \pi)$.

3. Find the constant a_0 for the function $\mathbf{f(x) = x \text{ in } 0 \leq x \leq 2\pi}$

4. Find the value of $\mathbf{a_n}$ in the Fourier expansion of f(x)= $\mathbf{x^2 \text{ in } (0, 2\pi)}$

5. Does f(x) = tan x possess a Fourier expansion in (0, π).

6. Obtain the Fourier sine series for $f(x) = 1$ in $(0, \pi)$.

7. Define the RMS value of a function f(x) over the interval (a, b).

8. Find RMS value of $f(x) = x^2$ in $(0, \pi)$

9. State Parseval`s identity for f(x) as Fourier series in (0,2l).

10. Define Harmonic Analysis.

PART B

1. Construct the Fourier series for $f(x) = x^2$ in $-\pi \le x \le \pi$ and hence deduce that

(i) $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ...\infty = \frac{\pi^2}{6}$

(ii) $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - ....\infty = \frac{\pi^2}{12}$

(iii) $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ...\infty = \frac{\pi^2}{8}$

(iv) $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + ...\infty = \frac{\pi^4}{90}$

2. The following table gives the variations of periodic current over a period:

t sec	0	T/6	T/3	T/2	2T/3	5T/6	T
A amp	1.98	1.3	1.05	1.3	-0.88	-0.25	1.98

Find the Fourier series upto second harmonic.

3. The following values of y give the displacement in inches of certain machine part for the rotation x of the fly wheel. Expand y in terms a Fourier Series upto third harmonic:

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0

4. Find the Fourier series as far as the second harmonic to represent the function given in the following data.

x	0	1	2	3	4	5
$f(x)$	9	18	24	28	26	20

5. Expand the Fourier series for the function $f(x) = x(2l - x)$ in $0 \le x \le 2l$

6. Expand the Fourier series for the function $f(x) = (l - x)^2$ in $(0, 2l)$

7. Expand the Fourier series for the function $f(x) = 2x - x^2$ in $0 \le x \le 2$

8. Expand the Fourier series for the function $f(x) = x$ in $-\pi \le x \le \pi$

9. Obtain the half range Fourier sine series for $f(x) = \begin{cases} x & ,0 < x < 1 \\ 2 - x & ,1 < x < 2 \end{cases}$

10. Obtain the half range Fourier Sine series for $f(x) = x(\pi - x)$ in $0 \le x \le \pi$

11. Obtain the half range Fourier cosine series for $f(x) = l - x$ in $0 \le x \le l$

12. Obtain the half range Fourier Sine series for $f(x) = \dfrac{\pi - x}{2}$ in $0 \le x \le \pi$