SNS COLLEGE OF ENGINEERING, COIMBATORE
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Accredited by NAAC-UGC with 'A' Grade
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TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS

UNIT – I

PART A

1. State the Dirichlet's conditions for existence of Fourier series.
2. Find the root mean square value of f(x) = x(ℓ – x) in 0 $\le x \le \ell$.
3. Define root mean square value of a function
4. Find the sine series of function f(x) = 1 in 0 < x < π
5. Expand f(x) = 1 as a Half range sine series in $(0,\pi)$
6. Find the half range sine series expansion of f(x) = 1 in (0, 2).
7. Find the value of the Fourier series of f(x) = $\begin{cases} 0 & (-c,0) \\ 1 & (0,c) \end{cases}$ at the point of discontinuity at x = 0.
8. Find the value of b_n in the Fourier series expansion of f(x) = $\begin{cases} x+\pi & (-\pi,\ 0) \\ -x+\pi & (0,\pi) \end{cases}$
9. Find the value of b_n in the Fourier series expansion of f(x) = x^2 in $(-\pi,\pi)$
10. Find the Fourier series expansion of f(x) = e^x in (0, 2 π)

PART - B

1. Find the Fourier series for a function f(x)= $\begin{cases} l-x & in\ 0<x<l \\ 0 & in\ l<x<2l \end{cases}$ in (0,2l)
2. Find the Fourier series for f(x) = $\frac{(\pi-x)}{2}$ in (0,2π)
3. Find the Fourier series for $f(x)=x^2$ in –π<x<π.
4. Find the Fourier series of $f(x)=x^2$ in –π<x<π. Hence deduce the value of $\sum_{n=1}^{\infty}\frac{1}{n^2}$
5. Find the Fourier series of f(x)=x in –π<x<π
6. Find the Fourier series of f(x)=xsinx in –π<x<π
7. Expand $f(x)=x^2$ as the Fourier series in the interval (-π,π) and hence deduce that

$$1+\frac{1}{2^4}+\frac{1}{3^4}+\frac{1}{4^4}+\ldots\ldots=\frac{\pi^4}{90}$$

8. Find the Fourier series in the function $f(x)=x+x^2$ in $(-\pi,\pi)$ and hence deduce the value of $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.....$
9. Find the Fourier series expansion the following periodic function of period 4

$f(x)=\begin{cases}2+x & in\ -2\le x\le 0\\ 2-x & in\ 0<x\le 2\end{cases}$ Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.....=\frac{\pi^2}{8}$

10. Find the Half range cosine series for $f(x)=x$ in $(0,\pi)$.
11. Find the half range cosine series for $f(x)=x(\pi-x)$ in $(0,\pi)$
12. Find the Half range cosine series of $f(x)=(\pi-x)^2$, $0<x<\pi$. Hence find the sum of series $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\frac{1}{4^4}+.....$
13. Find the half range cosine series expansion of $(x-1)^2$ in $0<x<1$.
14. Obtain the Fourier cosine series expansion of $f(x)=x$ in $0<x<4$. Hence deduce the value of $\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+.....\infty$
15. Find the Fourier series of $y=f(x)$ up to third harmonic which is defined by the following data in $(0,2\pi)$

x	0	π/3	2π/3	π	4 π/3	5 π/3	2 π
f(x)	1	1.4	1.9	1.7	1.5	1.2	1

16. Find the Fourier cosine series up to third harmonic to represent the function given by the following data:

x	0	1	2	3	4	5
y	9	18	24	28	26	20

17. Determine the first two harmonics of Fourier series for the following data.

x	0	T/6	T/3	T/2	2T/3	5T/6	T
f(x)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

$y_{n+2}+2y_{n+1}+y_n=n,\ given\ \ that\ \ y_0=0, y_1=0$