

### Assignment \_03

#### Sec\_13 and Sec\_14

Release date: 17.4.2024

Submission date: 23 April 2024 (Tuesday, 6pm)

Total Marks=40 (it will be converted to 20)

Online submission

1. Given that,  $f(t) = \begin{cases} -t, & -\pi \leq t < 0 \\ t, & 0 \leq t < \pi \end{cases}$ . And  $f(t)$  is periodic with period  $2\pi$ . [10]

(a) Sketch the function for 3 cycles.

(b) Find the trigonometric series for  $f(t)$ , using half-range series.

2. Let  $f(x) = \begin{cases} x, & 0 \leq x < \pi \\ -\pi - x, & -\pi \leq x < 0 \end{cases}$ . [10]

(a) Sketch the function on  $[-3\pi, 3\pi]$

(b) Find Fourier series of  $f(x)$

(c) Find sum of the Fourier Series at  $x = 0$ .

3. Using  $\int_{-\pi}^{\pi} \sin mx \, dx = 0$  and  $\int_{-\pi}^{\pi} \cos nx \, dx = 0$ , where  $m, n \in \mathbb{Z}$ . [10]

Prove the following identity:  $\int_0^{\pi} \sin nx \sin mx \, dx = \begin{cases} \frac{\pi}{2} & \text{if } n = m \\ 0 & \text{if } n \neq m \end{cases}$

4. If  $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$  is a square matrix and  $P$  is a matrix of all eigen vectors of  $A$ , [10]

Then find the eigen values and the corresponding eigen vectors of  $A$ . And also find  $P^{-1}AP$  is a diagonal matrix.