Section-3

ans-2 $\quad f(x) = 0.5(\pi - x)$ for $0 < x < 2$

$$\boxed{a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos nx\,dx}$$

$$a_n = \frac{1}{\pi}\int_0^{2\pi} 0.5(\pi - x)\cos nx\,dx$$

$$= \frac{0.5}{\pi}\int_0^{2\pi} (\pi - x).\cos nx\,dx$$

$$= \frac{1}{2\pi}\left[(\pi - x)\frac{\sin nx}{n} - (-1)\left\{\frac{-\cos nx}{n^2}\right]_0^{2\pi} = 0;$$

$$b_n = \frac{1}{\pi}\int_0^{2\pi} f(x) \sin nx\, dx$$

$$b_n = \frac{1}{\pi}\int_0^{2\pi} 0.5(\pi - x) \sin x\, dx$$

$$= \frac{0.5}{\pi}\int_0^{2\pi} (\pi - x) \sin x\, dx$$

$$= \frac{1}{2\pi}\left[-(\pi - x)\frac{\cos nx}{n} - \frac{\sin nx}{n^2}\right]_0^{2\pi} = \frac{1}{n}$$

$$a_0 = \frac{1}{\pi}\int_0^{2\pi} f(x)\, dx = \frac{1}{\pi}\int_0^{2\pi}\left(\frac{\pi - x}{2}\right) dx$$

$$= \frac{1}{2\pi}\left[\pi x - \frac{x^2}{2}\right]_0^{2\pi}$$

$$= \frac{1}{2\pi}\left[2\pi^2 - 2\pi^2\right] = 0.$$

$$\therefore f(x) = \frac{\pi - x}{2} = 0 + 0 \sum_{n=1}^{\infty} \frac{1}{n} \sin nx =$$

$$\sin x + \frac{1}{2}\sin 2x + \frac{1}{3}\sin 3x \ldots\ldots$$