



Assignment: 4

Sem/Sec: Branch:..... Session: 20__/_

M. M: ____

Date of issue:.....

Date of submission:.....

Q.1. Find the Fourier series for the function defined as

$$f(x) = \begin{cases} -1 & \text{for } -\pi \leq x < 0 \\ 0 & \text{for } x = 0 \\ 1 & \text{for } 0 < x \leq \pi \end{cases}$$

Hence prove that .

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$$

Q.2. Find the Fourier series to represent $f(x) = x - x^2$ in the interval $-1 < x < 1$.

Q.3. Find the half range sine series for

$$f(x) = x \sin x \text{ in the interval } 0 \leq x \leq \pi.$$

Q.4. Find the half range cosine series for

$$f(x) = (x - 1)^2 \text{ in the interval } 0 \leq x \leq 1,$$

hence show that
$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$$

Q.5. Find the half range sine series to represent

$$f(x) = x(\pi - x) \text{ for } 0 \leq x \leq \pi$$

Q.6. Find the fourier series for $\frac{1}{4}(\pi - x)^2$; $0 < x < 2\pi$

Q.7. Find the fourier series for $f(x) = e^{ax}$ $-\pi \leq x \leq \pi$

Q.8. Find the fourier series for $f(x) = \begin{cases} x & 0 \leq x \leq \pi \\ 2\pi - x & \pi \leq x \leq 2\pi \end{cases}$

Q.9. If $\alpha > 0$ is not an integer, show that $\cos \alpha x = \frac{2\alpha \sin \alpha \pi}{\pi} \left[\frac{1}{2\alpha^2} - \frac{\cos x}{\alpha^2 - 1^2} + \frac{\cos 2x}{\alpha^2 - 2^2} - \dots \right]$ for all $x \in [-\pi, \pi]$

Q.10. Find the Fourier series to represent $f(x) = \begin{cases} \frac{l}{4} ; & -l \leq x \leq -\frac{l}{2} \\ \frac{x^2}{l} ; & -\frac{l}{2} \leq x \leq \frac{l}{2} \\ \frac{l}{4} ; & \frac{l}{2} < x < l \end{cases}$