Fourier Series: in '2π' period

1) $f(x) = x^2$ in $(0, 2\pi)$

2) $f(x) = x$ in $(0, 2\pi)$

3) $f(x) = \frac{(\pi - x)^2}{4}$ in $(0, 2\pi)$

4) $f(x) = x^2$ in $(-\pi, \pi)$ & deduce that

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

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

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

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

5) $f(x) = x$ in $(-\pi, \pi)$

6) $f(x) = x(\pi^2 - x^2)$ in $(-\pi, \pi)$

7) $f(x) = \begin{cases} 1 + \frac{2}{\pi}x, & -\pi < x < 0 \\ 1 - \frac{2}{\pi}x, & 0 < x < \pi \end{cases}$

8) $f(x) = \begin{cases} \pi/2 + x, & -\pi < x < 0 \\ \pi/2 - x, & 0 < x < \pi \end{cases}$

9) $f(x) = |x|$ in $(-\pi, \pi)$

10) $f(x) = 1 + x + x^2$ in $(-\pi, \pi)$

Fourier Series in $2l$ period

1) $f(x) = (l-x)^2$ in $(0, 2l)$

2) $f(x) = \begin{cases} x, & 0 < x < 1 \\ 1-x, & 1 < x < 2 \end{cases}$

3) $f(x) = x^2$ in $(-l, l)$

4) $f(x) = \begin{cases} l+x, & -l \le x \le 0 \\ l-x & 0 \le x \le l \end{cases}$.

Half-Range : (cosine / sine)

$(0, \pi)$

1) $f(x) = x(\pi - x)$, $0 < x < \pi$

2) $f(x) = x$, $(0, \pi)$

3) $f(x) = \begin{cases} \pi/4\, x, & 0 < x < \pi/2 \\ \frac{\pi}{4}(\pi - x), & \pi/2 < x < \pi \end{cases}$

4) $f(x) = x^2$ $(0, \pi)$

$(0, l)$

1) $f(x) = x^2$, $(0, l)$

2) $f(x) = \begin{cases} x \text{ in } (0, l/2) \\ l-x \text{ in } (l/2, l) \end{cases}$

3) $f(x) = l - x$ in $(0, l)$

Harmonic Analysis :

1) x : 0 $\pi/2$ $2\pi/3$ π $4\pi/3$ $5\pi/3$ 2π

   y : 1.0 1.4 1.9 1.7 1.5 1.2 1.0

2) x : 0 $\pi/6$ $\pi/3$ $\pi/2$ $2\pi/3$ $5\pi/6$ π

   y : 1.98 1.30 1.05 1.30 -0.88 0.25 1.98

3) x : 0 1 2 3 4 5

   y : 9 18 24 28 26 20

Two Marks :

1) Dirichlet Cdtn.

2) Root Mean Square

3) Harmonic Analysis defn.

4) Find the Fourier Coefficients (either a_0, a_n or b_n)

5) Parseval's Identity.