The Open University of Sri Lanka
B.Sc./ B.Ed. Degree Programme
Open Book Test 2004/2005
Level 05-Applied Mathematics
AMU 3187/AME 5187 Mathematical Methods II

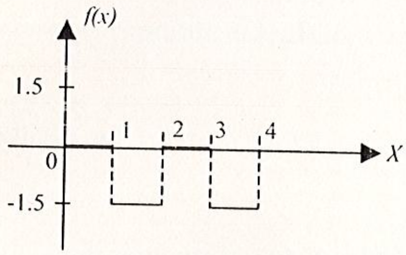
Duration: **One and half hours**

Date: 10.09.2005	Time: 4.00 p.m. – 5.30 p.m.

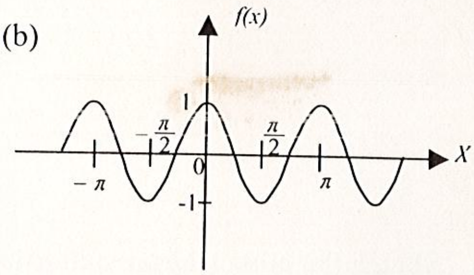
Answer all questions.

(1) (i) Define analytically the periodic functions shown.

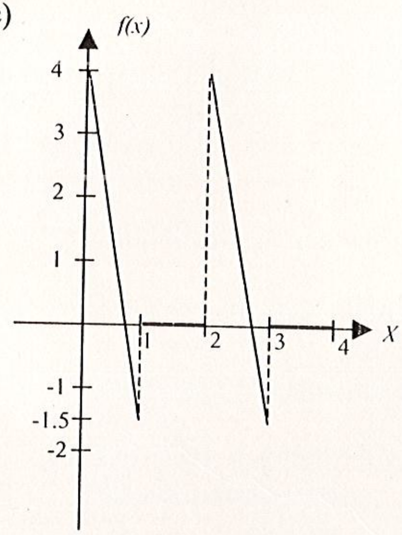
(a)



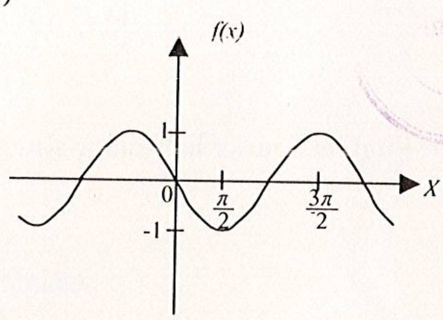
(b)



(c)



(d)



(ii) Find the period of each function given in part (i).

(iii) Assume that the Fourier coefficients of each function in part (i) are given.
Clearly show that, how to obtain the Fourier coefficients of the following periodic functions by using them.

(a) $f(x) = 3\cos 2x$

(b) $f(x) = \begin{cases} \frac{1}{2}(8-11x) & 0 < x < 1 \\ \frac{3}{2} & 1 < x < 2 \end{cases}$

(2) (i) Show that the function

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

has the Fourier Series

$$f(x)=\frac{4}{7\pi}\sum_{n=0}^{\infty}\frac{1}{(2n+1)}\sin(2n+1)x.$$

(ii) Evaluate both sides of this equality at an appropriate value of x and derive

$$\frac{\pi}{2\sqrt{3}}=1-\frac{1}{5}+\frac{1}{7}-\frac{1}{11}+\ldots.$$

(3) (i) **Sketch** the **odd** and **even extensions** on the interval [-4, 4] for the function;

$$f(x)=\begin{cases} x^2 & 0<x<1 \\ -2x+3 & 1<x<3 \\ 3x-12 & 3<x<4 \end{cases}.$$

(ii) Find its Fourier half-range **sine series.**