



# **MURANG'A UNIVERSITY OF TECHNOLOGY**

## **SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**UNIVERSITY ORDINARY EXAMINATION**

**2018/2019 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR, DIPLOMA IN  
ELECTRICAL AND ELECTRONICS ENGINEERING**

**SEE1306 – ENGINEERING MATHEMATICS VI**

**DURATION: 2 HOURS**

**DATE: 13/12/2018**

**TIME: 9 – 11 A.M.**

**Instructions to candidates:**

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

**SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION**

**QUESTION ONE (30 MARKS)**

a) Distinguish between periodic function and non-periodic function in Fourier series. (4 marks)

b) Obtain a Fourier series for the periodic function  $f(x)$  defined as:

$$f(x) = \begin{cases} -k, & \text{when } -\pi < x < 0 \\ +k, & \text{when } 0 < x < \pi \end{cases}$$

The function is periodic outside of this range with period  $2\pi$ . (11 marks)

c) Distinguish between even functions and odd functions. (4 marks)

d) Obtain a Fourier series for the function defined by:

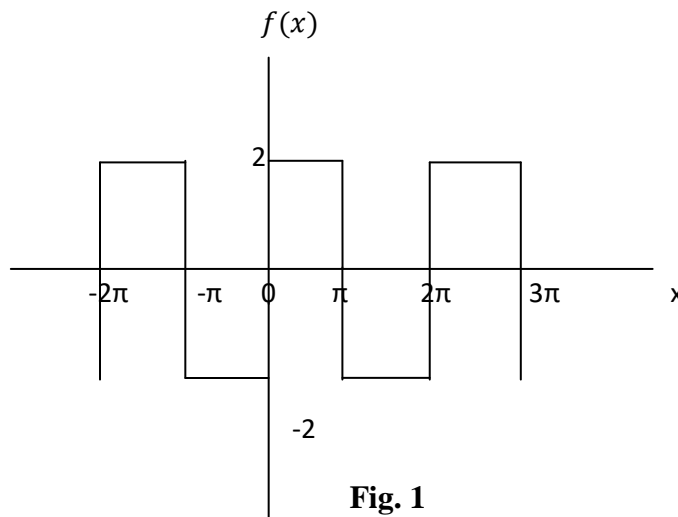
$$f(x) = \begin{cases} x, & \text{when } 0 < x < \pi \\ 0, & \text{when } \pi < x < 2\pi \end{cases}$$

(11 marks)

**SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION**

**QUESTION TWO (20 MARKS)**

a) Obtain the Fourier series for the square wave shown in Fig. 1 below. (8 marks)



**Fig. 1**

b) Determine the half range Fourier cosine series to represent the function  $f(x) = 3x$  in the range  $0 \leq x \leq \pi$ . (12 marks)

**QUESTION THREE (20 MARKS)**

- a) Find the half range Fourier series to represent the function  $f(x) = 3x$  in the range  $0 \leq x \leq \pi$ . (8 marks)

- b) The voltage from a square wave generator is of the form

$$v(t) = \begin{cases} 0, & -4 < t < 0 \\ 10, & 0 < t < 4 \end{cases}$$

and has a period of 8ms. Find the Fourier series for this periodic function. (12 marks)

**QUESTION FOUR (20 MARKS)**

- a) Using Green's Theorem, evaluate  $\oint [2x(x+y)dx + (x^2 + xy + y^2)dy]$  around the square with vertices at (0, 0), (1, 0), (1,1) and (0,1). (15 marks)
- b) Verify Stove's Theorem for  $F = (2x-y)i - y^2j - y^2zk$ , where S is the upper half of the sphere  $x^2+y^2+z^2 = 1$  and C is its boundary. (5 marks)