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**JARAMOGI OGINGA ODINGA UNIVERSITY OF**

**SCIENCE AND TECHNOLOGY**

**SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCES**

**UNIVERSITY EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS**

## SEMESTER TWO, FOURTH YEAR EXAMINATIONS 2015/2016

**MAIN**

**COURSE CODE: SMA 414**

### **COURSE TITLE: FOURIER ANALYSIS**

**Exam venue: Stream: BSc mathematics**

**EXAM SESSION:**

**DATE : TIME: 2hrs**

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### **INSTRUCTIONS**

### Answer **Question1** and **two** other questions

### **Show all the necessary working**

### **Question1 [30marks] Compulsory**

### **(a)** Assume that has a uniformly convergent Fourier series



(i) State the period of 

(ii) List (without computation) the first twenty Fourier coefficients of the expansion.

(iii) Give an application of Parseval Theorem in the Fourier expansion of 

(iv) Describe using a diagram the Gibb’s phenomenon on  [10 marks]

**(b)** Given the function  

(i) Sketch graph of over the interval 

(ii) Find the interval over which defines a full cycle

(iii) Determine whether  is odd or even [12 marks]

**(c)** Obtain the first eight Fourier **half-range** cosine coefficients for this function.

Sketch the symmetric even periodic extension of f(x) on (-,) [8 marks]

**Question2 [20marks]**

Given real valued function for which



(a) Show that 

[10 marks]

(b) Using result of part (a) above, take the first 40 nonzero terms to approximate  [10 marks]

**Question3 [20 marks]**

Find the particular steady periodic solution to the second order nonhomogeneous ordinary differential equation

 [20 marks]

**Question4[20marks]**

(a) Assume that has a uniformly convergent Fourier series

.

Prove that

(i)  [6 marks]

(ii)  [7 marks]

(iii)  [7 marks]

**Question5[20marks]**

(a) For the step function



(i) Deduce that may be expressed in an infinite series [8 marks]

(ii) Approximate the value the integral 

using Parseval’s theorem with;  [8 marks]

(b)Find the Fourier transform of the function the function  [4marks]