NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16, Ahmadu Bello Way, Victoria Island

SCHOOL OF SCIENCE AND TECHNOLOGY
October, 2013 Examination

Course code: CIT 754 **Time:** 3 Hours
Course title: Digital Communications
Credit unit: 3 credit units
Instruction: Answer any four (5) questions. Each question carries 14marks.

1 a. When can channel be said to be non distorting or ideal (1 mark)

b. List the three alternative methods which are often used to describe a convolutional code (3 marks)

c. Enumerate the properties for which A set G and a binary operation denoted by + constitute an Abelian group (4 marks)

$$v_l(t) = \sum_{n=-\infty}^{\infty} s_l(t - nT; \boldsymbol{I}_n)$$

Using the equation above taking that sl(t; **I**n) E {s1l(t), s2a(t), . . . , SM1(t)} is one of the possible M lowpass equivalent signals determined by the information sequence up to time n, denoted by **I**n = (. . . , **I**n-2, **I**n-1, **I**n) assume that **I**n is stationary process determine the power spectral density of vl(t) (10 marks)

2 a. List the classes which Channel codes can be classified into (2 marks)

b. Identify the properties of Cross products and Dot products of vector (4 marks)

c. Illustrate a rake demodulator using a well labelled block diagram (8 marks)

3 a. Define a finite-state channel (2 marks)

b. Briefly describe two algorithms for performing the optimization automatically and adaptively (6 marks)

c. Using a well labelled block diagram illustrate model for a finite-state channel (6 marks)

4 a. The capacity of a channel (2 marks)

b. Using a well labelled block diagram illustrate the specific model for the multichannel digital signaling system. Show the expression for the signal waveforms (12 marks)

5 a. Write short notes on the following (8 marks)
Phase fitter
Spread spectrum signal

b. Using a well labelled block diagram illustrate the model for the downlink transmission in a CDMA cellular communication system (6 marks)

6 a. Define a lowpass/ baseband signal Signal (2 marks)

b. List four factors which can affect the path loss in mobile radio communications

(4 marks)

c. Write short notes on any two of the following (8 marks)

Hamming Codes
Maximum-Length Codes
Golay Code

7. a. If s, (t) be the equivalent lowpass signal transmitted over the channel and let Sl(f)

denote its frequency content. Express in terms of the time-domain variables c(T;t)

and sl(t) the equivalent lowpass received signal, exclusive of additive noise. (4 marks)

b. Using a well labelled block diagram illustrate the model of the digital communication system for which the error rate performance will be evaluated (10 marks)