



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE (COMPUTER ENGINEERING)

SCE 425: SIGNALS

DATE: MONDAY 22ND NOVEMBER 2010

TIME: 2.00 P.M. - 4.00 P.M.

INSTRUCTIONS

- i) There are a total of five Questions
- ii) Question No. 1 is **compulsory** and carries 30 Marks.
- iii) Select **any other** two questions each of which carries 20 Marks.
- iv) Define all symbols used.
- v) Marks will be awarded for procedure, methodologies used and not necessarily the final answer.

QUESTION ONE

- a) i) Define what a signal is and name six (6) types of commonly used signals.
ii) What is ergodicity?
- b) i) Give the two equations forming the Fourier transform pair for a signal $s(t)$.
ii) Given a periodic signal $x(t)$, write it in its Fourier series representation in the
 - 1) Trigonometric form
 - 2) Harmonic form
- c) i) State Parseval's energy theorem and explain the difference between energy and power signals.
ii) Discuss the principles of dynamic representation of signals.

QUESTION 2

- a) i) Given two deterministic signals $u(t)$ and $v(t)$ derive their scalar product and establish their signal energy.
ii) Give the generalized Rayleigh formula and its interpretation.
- b) i) Outline the task properties of the Fourier transform 6.
ii) Given a periodic signal $s(t)$ write its mathematical model and its spectral representation a term of Fourier series 12

QUESTION 3

- a) i) Demonstrate thorough understanding of the Delta Diral function and give its properties.
ii) Explain the spectrum of a time variant signal.
- b) i) Define Narrowband signal
ii) Define the physical envelop of a Narrow band signal its total phase and instantenous frequency.

QUESTION 4

- a) i) Consider a periodic signal $x(t)$, Discuss its harmonic analysis over a time interval (t_1, t_2) .
ii) Discuss the relation between the duration and bandwidth of a pulse.
- b) Consider a complex exponential signal. Explain its spectrums indicating clearly the points to be noted from the results.

QUESTION 5

- a) Demonstrate thorough understanding the sampling theorem 8
- b) i) Define a random process
ii) Determine the power spectrum of a stationary random process.