(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS

YEAR THREE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: CSC 350E.

COURSE TITLE: SIGNALS AND SYSTEMS I

DATE: 14/12/2022 **TIME: 9.00 A.M. – 11.00 A.M.**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE IN SECTION A AND ANY OTHER TWO (2)

QUESTION ONE (COMPUSORY) [30 MARKS]

a) Define the following terms:-

i) Signal [2 marks]

ii) System [2 marks]

b) Describe the following types of signals [6 marks]

i) Continuous-time signal x(t)

ii) Discrete-time signal x[n]

c) Write the equivalent and exponential forms of the vector 3+j4 and illustrate it by means of a diagram [6 marks]

d) Differentiate between the following types of signals

i) Deterministic signal [2 marks]

ii) Random signal [2 marks]

e) State and explain three system requirements for linearity.

i) Homogeneity [3 marks]

ii) Additivity [3 marks]

iii) Shift invariance

f) Using diagrams distinguish between the following terms.

i) Discrete-time unit impulse signal $\delta(t)$ [2 marks]

ii) Discrete-time unit step signal $u(t)$ [2 marks]

$$\delta(t) = \begin{bmatrix} 1, & n = 0 \\ 0 & n \neq 0 \end{bmatrix}$$

QUESTION TWO [20 MARKS]

a) State and explain four properties of an impulse function [16 marks]

b) Given the function $y(t) = 2x^2(t-1) + x(3t)$ show that it is stable [4 marks]

QUESTIONTHREE [20 MARKS]

a) Determine whether the system $y(t) = 2\pi x(t)$ is linear [6 marks]

b) Differentiate between Time invariant and causal systems [4 marks]

c) Define the following system properties

i) Memoryless [2 marks]

ii) Invertible [2 marks]

iii) Time-invariant [2 marks]

iv) Linear [2 marks]

QUESTION FOUR [20 MARKS]

a) Explain the following terms

i) Periodic [3 marks]

ii) Aperiodic signals [3 marks]

iii) Proof that the signal x(t) = sin(ω_0 t), $\omega_0 > 0$, is periodic. [6 marks]

It can be shown that

b) Find the fundamental period of the following signals:

(i) $e^{j3\pi t/5}$ [4 marks]

(ii) ii) $e^{j3\pi n/5}$ [4 marks]

QUESTION FIVE [20 MARKS]

a) Outline the difference between linear and non-linear systems giving two examples for each [8 marks]

b) Given the signal $x(t) = e^{-at}u(t)$, for a>0 determine

i) The Fourier Transform $X(j\omega)$ [4 marks]

ii) The magnitude $|X(j\omega)|$ [4 marks]

iii) The phase $\angle X(j\omega)$ [4 marks]