(KNOWLEDGE FOR DEVELOPMENT)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2020/2021 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: 13/07/2021 TIME: 9.00 A.M – 11.00 A.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE [COMPULSORY] [30 MARKS]

a) With the aid of diagrams describe how signal and systems are related [4 marks]

b) Differentiate between the following terms:

i) Periodic and non-periodic signals. [4 marks]

ii) Continuous-time signal x(t) and Discrete-time signal x[n] [6 marks]

iii) Even and odd signals. [4 marks]

c) With relevant examples explain **THREE** operations performed on a signal. [6 marks]

d) Given the signal $x(t) = e^{-3t}u(t)$, determine

i) The Fourier Transform $X(j\omega)$

ii) The magnitude $|X(j\omega)|$

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

QUESTION TWO [20 MARKS]

a) Convert the following complex numbers from Cartesian to polar form

i) 1+3j; [2 marks]

ii) 2-3j. [2marks]

b) State and explain two ways of representing discrete time systems. [4 marks]

c) Show that the following system linear-time-invariant

y(t) = x(t)g(t), where x(t) and y(t) denote the input and output, respectively. [3 marks]

d) Outline the difference between energy and power signal. [4 marks]

e) Show that the discrete time system described by the input-output relationship y[n] =nx[n] is linear. [5 marks]

QUESTION THREE [20 MARKS]

a) Differentiate between a continuous and discrete time signals. [4 marks]

b) Is a discrete time signal described by the input output relation $y[n] = r^n x[n]$ time invariant. [4 marks]

c) Evaluate, the magnitude $|(2-j3)^3|$ and the angle $\angle (-2-j)^2$. [8 marks]

d) For the signal x(t) shown in Fig. 3.1, sketch x(2t-3). [4 marks]

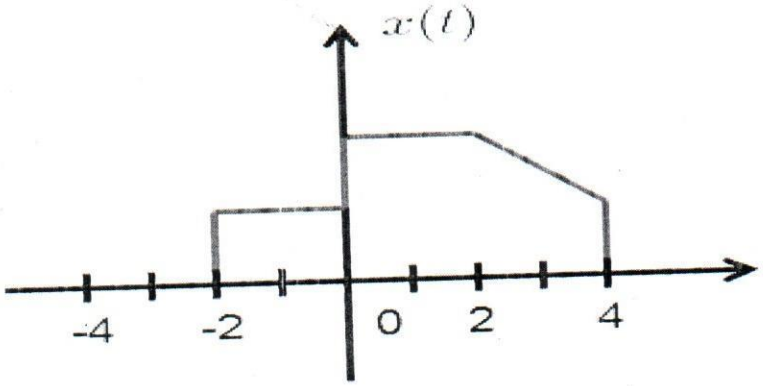

Figure 3.1

QUESTION FOUR [20 MARKS]

a) Determine if the following signals are periodic. For those that are periodic, what is the fundamental period?

i) $x[n] = e^{j\frac{4}{\pi}n}$ [2 marks]

ii) $x[n] = e^{j\frac{3}{8}\pi n}$ [2 marks]

b) Briefly describe a time invariant system [4 marks]

c) Compute the polar form of the complex signals [6 marks]

i) $e^{j(1+j)}$

ii) $(1+j)e^{-j\pi/4}$.

d) Compute the rectangular form of the complex signals [6 marks]

i) $3e^{j3\pi/4}$ [3 marks]

ii) $e^{-2j\pi} + e^{j5\pi}$. [3 marks]

QUESTION FIVE [20 MARKS]

a) State and explain any **TWO** types of systems. [6 marks]

b) Outline the properties of a system. [4 marks]

c) Suppose *x[n]* is a discrete-time signal, and let *y[n]=x[2n]*.

i) If *x[n]* is periodic, is *y[n]* periodic? If so, what is the fundamental period of *y[n]* in terms of the fundamental period of x*[n]*? [3 marks]

ii) If *y[n]* is periodic, is *x[n]* periodic? If so, what is the fundamental period of *x[n]* in terms of the fundamental period of *y[n]*? [3 marks]

d) Sketch the signals

i) u[n-3] [2 marks]

ii) u[2n-3] [2 marks]