(Knowledge for Development)

KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS

YEAR THREE SEMESTER TWO EXAMINATIONS

FOR DEGREE OF

(COMPUTER SCIENCE)

COURSE CODE : CSC 354E

COURSE TITLE : SIGNALS AND SYSTEMS II

DATE: 12/10/2021 **TIME: 02.00 P.M – 04.00 P.M**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Define z-transform [3mks]

b) Define Laplace transform [3mks]

c) Find the expression of frequency response for a system with a transfer function of $G(s) = \frac{1}{1+2s}$ and then evaluate the magnitude and phase angle of frequency response at $\omega = 0.5 rad/s$ and represent the result in the complex plane. [8mks]

d) Find the Laplace transform of f(t)=1 and comment on the result [6mks]

e) Given that $\mathcal{L}(e^t) = 1/(s-1)$, find $\mathcal{L}(e^{at})$ [4mks]

f) Find the Laplace transform of $f(t) = \cos 3t$ [6mks]

QUESTION TWO [20 MARKS]

a) Find the Laplace transform of rectangular pulse signal [10mks]

$$f(t) = \begin{cases} 1 & \text{if } a \le t \le b \\ 0 & \text{otherwise} \end{cases} \quad \text{where } 0 < a < b$$

b) Consider the signal $x[n] = a^n u[n]$, with $0 < a < 1$. Find its Z-transform [10mks]

QUESTION THREE [20 MARKS]

a) Determine the inverse Laplace transform of

$$X(s) = \frac{s+3}{(s+1)(s-2)}$$

[15mks]

b) Define ROC of z-transform [5mks]

QUESTION FOUR [20 MARKS]

a) Determine the z-transform of the signal [15mks]

$x[n] = a^n u[n]$, with $0 < a < 1$

b) Outline FIVE properties for Laplace Transform [5mks]

QUESTION FIVE [20 MARKS]

a) Find the inverse z-transform of

$$X(z)\{= \frac{z}{z(z-1)(z-2)^2}, |z| > 2$$ [10mks]

b) Consider an ideal low-pass filter with frequency response

$$H(w) = \begin{cases} 1 & |\omega| < \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

The input to this filter is

$$x(t) = \frac{\sin at}{\pi t}$$

i. Find the output $y(t)$ *for* $a < \omega_c$ [4mks]

ii. Find the output $y(t)$ *for* $a > \omega_c$ [4mks]

iii. In which case does the output suffer distortion? [2mks]