(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2022/2023 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ELECTRICAL AND COMMUNICATION ENGINEERING

COURSE CODE: ECE 316

COURSE TITLE: DIGITAL ELECTRONICS I

DATE: 5TH DECEMBER, 2022 **TIME:** 3: 00 PM – 5:00 PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION 1

1a) Perform the following operations:

i. Write the decimal number 369_{10} into BCD code (1mk)
ii. Convert the hexadecimal number F8E6 to corresponding decimal number. (1½mks)
iii. Encode the following number into 8421 BCD number 584. (1mk)

b) Explain the advantages of the octal number system. (4mks)

c) Give any three differences between combinational logic circuits and sequential circuits (3mks)

d) A committee of three individuals decide issues for an organization. Each individual votes either yes or no for each proposal that arises. A proposal is passed if it receives at least two yes votes. Design a circuit that determines whether a proposal passes. (6mks)

e) State any four applications of logic gates. (4mks)

f) Using the truth table, prove that A+AB'=A+B and illustrate the equivalence with the help of a switching circuit. (4mks)

g) Design a circuit of 5 input variables that generate output 1 if and only if the member of 1's in the input is prime. (5½mks)

QUESTION 2

2a) Explain what is meant by the term register. (1½mks)

b) Using four flip flops. Explain the operation of parallel input parallel output (PIPO) register. (8mks)

c) A panel light in the control room at the launching of a satellite is to go ON if and only if the pressure in both fuel and oxidizer tanks is equal to or above the required minimum and there are 10 minutes or less to lift off, or if the pressure in the oxidizer tank is equal to or above required minimum and the pressure in fuel tank is below a required minimum but there are more than 10minutes to lift off, or if the pressure in the oxidizer tank is below a required minimum but there are more than 10 minutes to lift off. Design a two level gate combinational circuit to control panel light. (10½mks)

QUESTION 3

3a) Simplify the following expressions.

i. (AB+C)(AB+D) (2mks)
ii. ABC'+AB'C'+A'BC+ABC+AB'C. (2mks)

b) Draw the truth table and logic circuit of half subtractor.
(5mks)

c) Two electrical signals represented by A=101101 and B=110101 are applied to a 2 input AND gate .sketch the output signal and binary number it represents. (3mks)

d) Using a bank circuit of NAND gate. Explain the operation of Transistor Logic circuit. (TTL). (6mks)

e) Explain what is meant by the term noise immunity as it's applied to logic families. (2mks)

QUESTION 4

4. Explain the operation of 2bit ripple up counter that utilizes toggle flip flop. (20mks)

QUESTION 5

5a) Draw the D type flip flop circuit and explain how it overcomes the main disadvantages of the basic SR NAND gate Bistable circuit. (5mks)

b) Using a well labeled diagram and waveforms. Explain how a D type flipflop can be used as a divide by 2 counter. (5mks)

c)(i) State any three applications of a multiplexer. (3mks)

ii. Design 4×1 multiplexer (include truth table, block diagram and logic diagram) (7mks)