



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY AND APPLIED PHYSICS

EEE4350 : DIGITAL ELECTRONICS & DEVICES

END OF SEMESTER EXAMINATION

SERIES : MAY 2016

TIME: 2 HOURS

DATE: Pick DateSelect MonthPick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt **Question ONE (Compulsory)** and any other **TWO Questions**

Do not write on the question paper.

Question ONE

- a. Show that $A.(B \oplus C) = A.B \oplus A.C$ (5 marks)
- b. i. Use simple D.C. circuits comprising of a battery source, two switches and lamp to explain the logic functions of the following:
 - I. An “AND” gate
 - II. An “NOT” gate
- ii. Draw the symbol and truth table for each gate (6 marks)
- c. Perform the following operations:
 - i. $3F_{16} - 5C_{16}$ (using 2’s complement)
 - ii. $36_{10} + 63_{10}$ (using Excess-3 code)
 - iii. $11111_2 - F.F_{16}$ (using Hexa subtraction)

(6 marks)

- d. Describe the following coding schemes that are used for the interchange of information:
- ASCII code
 - EBCDIC code (4 marks)
- e. Use a Karnaugh Map to simplify the following Boolean expression:
- $$F(w, x, y, z) = \bar{w}\bar{x}\bar{y}\bar{z} + \bar{w}\bar{x}\bar{y}z + \bar{w}\bar{x}y\bar{z} + \bar{w}xy\bar{z} + w\bar{x}\bar{y}\bar{z} + w\bar{x}\bar{y}z + w\bar{x}y\bar{z}$$
- (5 marks)
- f. Name and describe the two types of propagational delay time, t_p . (4 marks)

Question TWO

- a. i. With the aid of a circuit diagram, explain the principle of operation of a 4-way multiplexer.
 ii. Describe a data selector logic for a 4 x 2 system
 iii. State one application of a multiplexer. (10 marks)
- b. Design a BCD counter using JK flip-flops. (10 marks)

Question THREE

- a. Explain **TWO** disadvantages of digital techniques over analogue techniques. (4 marks)
- b. Describe the 2-bit logic comparator (8 marks)
- c. i. Differentiate between static and dynamic shift registers
 ii. Differentiate between synchronous and asynchronous counters (8 marks)

Question FOUR

- a. Show how a NAND gate can be used to realize an XNOR gate (4 marks)
- b. Describe with an aid of a circuit how the OR gate can be used in industrial chemical control plant. (8 marks)
- c. Given the function $F(x, y, z) = x\bar{y}z + \bar{x}\bar{y}z + xyz$
- Draw the truth table for F .
 - Draw the logic diagram using the original Boolean expression.
 - Simplify the expression using Boolean algebra and identities.
 - Draw the logic diagram for the simplified expression. (8 marks)

Question FIVE

- a. Explain what is meant by race around condition in J-K flip-flop. (2 marks)
- b. Draw a master-slave J-K flip-flop system. Explain its operation and show that the race-around condition is eliminated. (12 marks)
- c. Perform the following operations:
- 1978_{10} to binary
 - 10101100111_2 to Gray
 - $57_{10} + 98_{10}$ (using BCD)
 - $AF50E_{16}$ to BCD (6 marks)