MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION DIPLOMA IN ELECTRICAL ENGINEERING

EED 215: DIGITAL ELECTRONICS II

DATE: 18/12/2017 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS:

*This paper consists of **FIVE** Questions. Answer Question ONE and ANY OTHER TWO questions.*

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Simplify the Boolean expression below (4 marks)

b) Distinguish between combinational logic circuits and sequential logic circuits. (6 marks)

c) How are the design requirements of combinational and sequential circuits specified? (8 marks)

d) Reduce the following equation using k-map (6 marks)

$$Y = \overline{A}\overline{B}\overline{C} + A\overline{C}\overline{D} + A\overline{B} + ABC\overline{D} + \overline{A}\overline{B}C$$

e) Implement the following SOP function using NAND gate only F = XZ + Y′Z + X′YZ (6 marks)

QUESTION TWO (20 MARKS)

a) What is a decoder? (2 marks)

b) Draw the logic circuit of a 3 line to 8 line decoder and explain its working (10 marks)

c) What is a shift register? Can a shift register be used as a counter? If yes, explain how? (8 marks)

QUESTION THREE

a) With the aid of a diagram, explain the working of a Clocked SR Flip-Flop (8 marks)

b) Storage components store data and perform simple data transformations, explain the following components (6 marks)

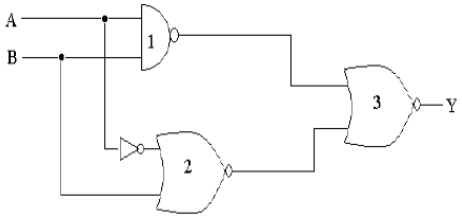
i. Register:
ii. Counter:
iii. Memory unit:

c) Draw the logic circuit of a 3 line to 8 line decoder and explain its working. (6 marks)

QUESTION FOUR (20 MARKS)

a) With the aid of a logic circuit of a TTL NAND gate briefly explain its operation. (10 marks)

b) Find the Boolean expression for the logic circuit shown below. (5 marks)



c. What is the equivalent of the following Boolean Expression? (5 marks)

$\overline{A}.B + A.\overline{B} + A.B$

QUESTION FIVE (20 MARKS)

a) What is Tri-state logic (2 marks)
b) Explain Tri-state logic inverter with the help of a circuit diagram. (8 marks)
c) Provide the Tri-state logic Truth Table. (6 marks)
d) Simplify the following boolean expression (4 marks)

$$\left(\overline{A}\overline{B}\overline{C}\right) + \left(A\overline{B}\overline{C}\right)$$