



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2013/2014

**FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE &
TECHNOLOGY, COMPUTER SCIENCE & MATHEMATICS &
COMPUTER SCIENCE)**

(MAIN CAMPUS)

SCS 110/CCS 111: DIGITAL ELECTRONICS I

Date: 15th July 2014

Time: 8.30 - 10.30 am

INSTRUCTIONS:

- Attempt question ONE and any other TWO questions.
- Write your registration number on all sheets of the answer book used.
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.
- Fasten together all loose answer sheet.
- No mobile phones and PDAs in the examination room.



Question ONE (30mks)

- a) Convert the following decimal numbers into binary:
- i) 10.25
 - ii) 121.75
- b) Perform the following binary arithmetic operation:
- i) $101110/111$
 - ii) $7-11$
 - iii) 1011×1010
 - iv) $0111 + 0101$ (both numbers BCD)
- c) Derive the truth tables for the following gates:
- i) 3-input NAND
 - ii) 3-input NOR
- c) Sketch the logic circuit for the Boolean function
- d) i) Sketch the logic circuit for the Boolean function
 $Z = ABD + ABD' + A'C + A'BC + ABC$
- ii) Minimize the function and sketch its logic circuit
- e) Minimize the function
 $F = \sum m(0,2,3,5,9,11)$ using a K-map

Question TWO (20mks)

- Fig Q2(a) shows the circuit diagram of a standard TTL gate. Describe its operation and hence fill its truth table, given that $x = f(a,b)$
- Would the circuit still perform its logic function if diode D3 is removed? Explain your answer.
- Transistor T3 can be removed and replaced with the circuit of Fig. Q2(b). What are the advantages and disadvantages of doing so?

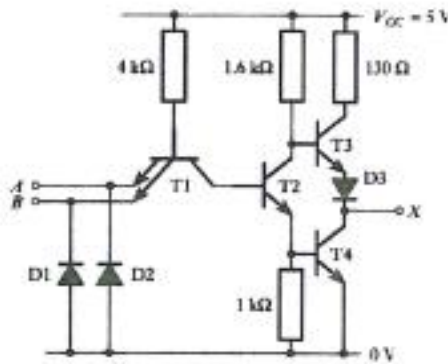


Fig Q2(a)

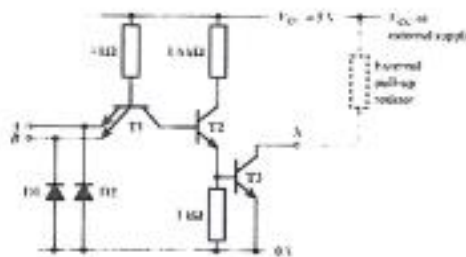


Fig Q2(b)

Question THREE (20mks)

Given the function

$$F(a,b,c,d) = \sum(2,4,8,9,10,11,13,15)$$

- Sketch the K-map for the function
- Derive the minimized function from the k-map

Question FOUR (20mks)

Minimize the following Boolean function using the Quine–McCluskey procedure:

$$f(A, B, C, D, E) = \sum m(0, 1, 2, 9, 11, 12, 13, 27, 28, 29)$$

Question FIVE (20mks)

- a) Briefly explain the difference between a 'latch' and a 'flip-flop'.
- b) With the aid of a truth table explain the operation of the SR-latch
- c) What are the disadvantages of the SR? Show how the JK flip-flop solves these problems