SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN ELECTRONICS

ELC 201: DIGITAL ELECTRONICS I

13 TH DECEMBER, 2016 **TIME: 1.30-3.30 P.M**

INSTRUCTIONS TO THE CANDIDATES

(a) This paper consists of five questions

(b) Answer question **ONE** and **ANY OTHER TWO** questions

Question One (30marks)

a) Convert the following

(i) 321. 104_8 to decimal **(2 marks)**

(ii) 97.3125_{10} to its binary equivalent **(2 marks)**

b) Sketch a two-input OR Gate equivalent circuit given the necessary circuit components and;

(i) Two switches **(2 marks)**

(ii) Three transistors **(3 marks)**

c) Briefly explain the following number systems in terms of radix and position value;

(i) The binary number system **(2 marks)**

(ii) Decimal number system **(2 marks)**

(iii) Octal number system **(2 marks)**

d) Find the Boolean expression for the output Y and compute its value when

$A = B = C = 1$ and $D = 0$ for the fig (1) and (2) shown below

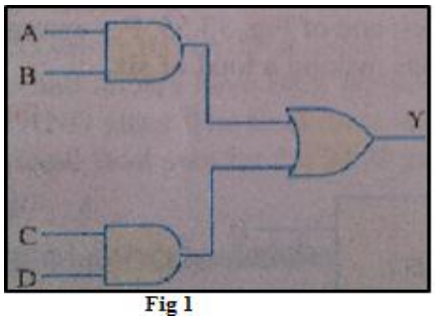

Fig 1

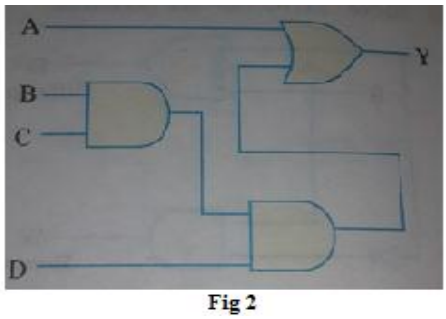

Fig 2

(4 marks)

e) Proof the following Boolean identities

(i) $AC + ABC = AC$ **(2 marks)**

(ii) $(A + B)(A + \bar{B})$ **(2 marks)**

f) Sketch the following circuit

(i) The basic NOR RTI circuit **(2 marks)**

(ii) The basic DTL circuit **(1 marks)**

g) Demorganize the following

(i) $\overline{(A+B)(C+D)}$ **(2 marks)**

(ii) $(AB+C)(AB+D)$ **(2 marks)**

Question Two (20marks)

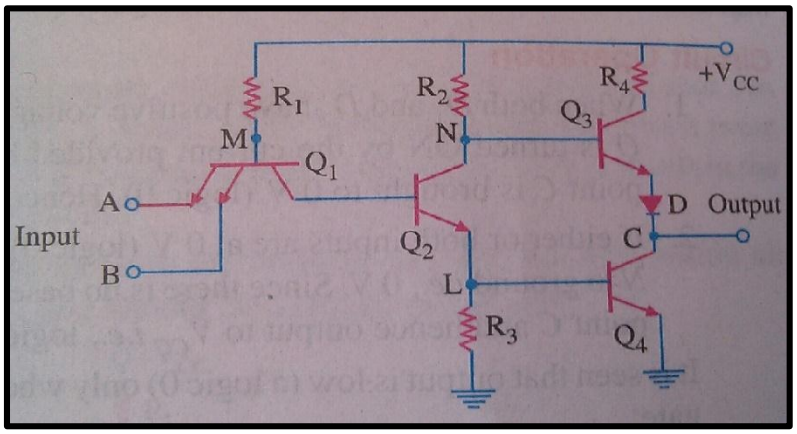

Figure 3

Use figure (3) above to answer questions (a) and (b)

a) From the figure

(i) Sketch the basic circuit for the TTL family and **(3 marks)**

(ii) Explain its circuit operation **(4 marks)**

b) The practical form of a TTL is shown infig (iii). Explain what happens to the circuit when

(i) The input is high **(5 marks)**

(ii) The input is low **(5 marks)**

(iii) State three (3) advantages of the standard TTL family **(3 marks)**

Question Three (20 marks)

a) Convert the following in to their binary equivalent

(i) 0.8796_{10} **(3 marks)**

(ii) 5632_{8} **(3 marks)**

(iii) $34F_{16}$ **(4 marks)**

b) Subtract 01101_2 from 11011_2 using;

(i) $1's$ complement **(2 marks)**

(ii) $2's$ complement **(2 marks)**

c) Multiply 1111 by 1110 **(4 marks)**

d) By use of low for 1 and high voltage for 0 sketch the following electrical signals

(i) 10110101011 **(1 mark)**

(ii) 11011010001 **(1 marks)**

Question Four (20 marks)

a) Find the switching circuits for the following logic expressions

(i) $A.(B+C)$ **(2 marks)**

(ii) $A\overline{B}+CD$ **(2 marks)**

(iii) $(\overline{A}B+AC)\overline{C}$ **(2 marks)**

b) Simplify the following Boolean expressions

(i) $A\overline{B}C+AB\overline{C}-ABC$ **(3marks)**

(ii) $A[B+C(\overline{AB+AC})]$ **(3 marks)**

(iii) $A\overline{B}\overline{D}+ABC\overline{D}+AB\overline{C}\overline{D}+\overline{A}\overline{B}\overline{D}+\overline{A}BC\overline{D}$ **(4 marks)**

c) Use the truth table to verify the following identities

(i) $\overline{A} + B = \overline{A}B$ **(2 marks)**

(ii) $A(\overline{A} + B) = AB$ **(2marks)**

Question Five (20 marks)

a) Given a two input NOR Gate

(i) Sketch its symbol **(1 mark)**

(ii) Sketch its equivalent relay circuit **(1 marks)**

(iii) Write down its truth table **(1 mark)**

(iv) Sketch and explain how the transistor NOR Gate operates **(4 marks)**

b) NOR Gate is a universal Gate. Explain how it can be used as

(i) OR gate **(2 marks)**

(ii) AND gate **(2 marks)**

(iii) NOT gate **(2 marks)**

c) Explain using a sketch how the following operate

(i) Parallel binary adder **(4 marks)**

(ii) Half subtractor **(3 marks)**