EAST AFRICAN SCHOOL OF AVIATION
EXAMINATION

END TERM I

ENGINEERING SECTION

SUBJECT: MICRO CONTROLLER TECHNOLOGY

STREAM: Module III (AVIONICS)   **Duration: 2HRS 30 mins**

DAY/DATE: 3rd April 2017   **TIME: 9Am – 12Pm**

INSTRUCTION TO CANDIDATES

1. *Answer any ALL **questions***

2. *Maximum marks for each part of a question are as shown*

1. a)   Explain why binary number system is employed in digital systems

(2 marks)

b)   Fill the conversion table below and show all the workings.

Decimal	Binary	Octal	Hexadecimal
		753.6	
			3EB
563.2			
	10111100111101		

(12 marks)

c)   The number CAB_{16} is a two byte. Determine its decimal value if it is in
      I.   Ones's complement
      II.   Two's complement

(6 marks)

2   a)   (i)   Evaluate the following, showing all the working
      I. $BEBC_{16} - 94EF_{16}$

(4 marks)

b)   (ii)   Use 8-bit 2's complement arithmetic to evaluate $(-37_{10}) - (69_{10})$

(5 marks)

(iii)   For the one bye number, 10011101_2, determine its decimal value if it is in
      I. One's complement
      II. Two's complement
      III. Unsigned

(6 marks)

b)   State three methods used to represent negative numbers

(3 marks)

c)   State two advantages of using hexadecimal over binary number systems

(2 marks)

3   a)   (i)   Define a canonical term. Distinguish between a maxterm and a minterm

(4 marks)

(ii)   Obtain the standard sum of products (SSOP) form of the following
Boolean function
F = AB + ACD' +B'D   (5 marks)

b)   For the following Boolean function

F (A,B,C,D) = Σ (0,1,2,3,7,8,9,12,14)

    i Draw the truth table
    ii Draw a K-map representation of the function
    iii Simplify and state the output function as a sum of products
    iv Implement the simplified circuit   (11 marks)

4   a)   A function F is defined such that it equals logic 1 when a 4 bit input code is equivalent to any of the decimal numbers 3,6,9,12 or 15. F is logic 0 input codes 0,2,8 and 10. F is indeterminate for other input values

    i   Use a truth table and Karnaugh map to determine the minimal expression for this function

    ii Implement the minimal expression using
        I.   NAND gates
        II.   NOR gates   (14 marks)

     b)   use the Boolean algebra postulates and theorems to minimize the following expressions
        i $XYZ + X'YZ' + X'YZ + XYZ' + X'Y'Z'$
        ii $AB + CB' + CAB + ABD$ (6 marks)

5   a)   State the difference between sequential logic circuit and combinational logic circuits giving an example of each.   (2 Marks)

     b)   Using suitable expressions and truth table implement a 1-bit digital comparator
        (5 marks)

     c)   With the aid of a truth table and logic expressions, implement a 4-to-line multiplexer (data selector)   (4 Marks

     d)   Perform the following binary arithmetic
        i.   1011011 + 1011110
        ii.   1011 – 1101 using two's complement method
        iii. 1100 – 10001 using one's complement   (9 marks)