PROGRAM : NATIONAL DIPLOMA
          ENGINEERING : COMPUTER SYSTEMS
          ENGINEERING : ELECTRICAL

SUBJECT : DIGITAL SYSTEMS 1

CODE : EDS121

DATE : 7 JUNE 2016
       WINTER Main Examination

DURATION : 12:30 - 15:30

WEIGHT : 40 : 60

TOTAL MARKS : 100

ASSESSOR : MR V Rameshar

MODERATOR : MR D.R. Van Niekerk

NUMBER OF PAGES : 3 PAGES

INSTRUCTIONS

1. NO CALCULATORS ALLOWED.

2. All sketches must be neat and FULLY labelled.

3. Please write in ink (Blue or Black). Pencil work will be taken as rough work.
QUESTION 1

CALCULATE the following in binary:

1.1 \(27.5_8 + 7.25_{16}\)  \(\text{(6)}\)

1.2 \(156_8 \times 11010_2\)  \(\text{(5)}\)

1.3 \(101110_2 + 1101_2\)  \(\text{(5)}\)

1.4 \(17_{10} - B_{16}\)  \(\text{(6)}\)

1.5 Find 1’s compliment of decimal number 246  \(\text{(3)}\)

1.6 Find 2’s compliment of 26_{10}  \(\text{(3)}\)

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QUESTION 2

2.1 Sketch the logic gate circuit diagram of the following Boolean expression below:

\[F = (\overline{A} + B)(B + \overline{C})(C + \overline{D})\]  \(\text{(5)}\)

2.2 Sketch 5 basic logic gate symbols and show the truth tables with inputs and outputs.  \(\text{(10)}\)

2.3 Use Boolean algebra rules to simplify to following expressions:

2.3.1 \(\overline{A}B\overline{C} + AB\overline{C} + \overline{A}BC\)  \(\text{(5)}\)

2.3.2 \(A\overline{B} + BC + AC\)  \(\text{(5)}\)

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QUESTION 3

3.1 Sketch a full adder circuit and determine the truth table, highlighting on the Cin and Cout pins.  \(\text{(10)}\)

3.2 Define the term multiplexer and then sketch a 4 to 1 multiplexer and give its truth table.  \(\text{(10)}\)

3.3 Explain how the hamming code is found and why it is utilized in the transfer of data.  \(\text{(4)}\)

[24]
QUESTION 4

4.1 State which of the follow are analogue quantities and which are digital quantities:

a) a radio tuning dial
b) cell phone key pad
c) a toggle switch
d) a television remote
e) an automatic washing machine program

(5)

4.2 Explain noise in a digital circuit and how it affects a digital signal. Make use of sketches.

(4)

4.3 Show with the aid of sketches fixed and variable frequencies with respect to a digital signal.

(4)

[13]

QUESTION 5

5.1 By using karnaugh mapping simplify the expression below and sketch the logic circuit diagram of the simplified output. Show all steps involved.

\[ Y = \overline{ABCD} + \overline{ABCD} + \overline{ABCD} + ABCD + \overline{ABCD} \]

[10]

TOTAL = 100