EEE 3131 ASSIGNMENT 2: Due Date: Wednesday, 2nd December, 2015

[Problem 1]

(a) Using signed 2's complement notation, express as 8-bit words the decimal numbers $+25$, $+121$, and -96.

(b) Hence, show in binary notation the arithmetic operations: $121-25$, and $25-96$.

(c) Explain briefly how subtraction is accomplished using 2's complement notation.

[Problem 2]

(a) Write the excess-3 equivalent codes of $(5)_{10}$, $(77)_{10}$, and $(437)_{10}$, all in **16-bit** format.

(b) Multiply the numbers $(13.5)_{10}$ and $(2.5)_{10}$ **directly** and using their **binary equivalents**.

(c) Divide $(100.0001)_2$ by $(10.1)_2$ correct to two binary places.

[Problem 3]

An electric light is to be controlled by three switches. The light is to be **ON** whenever switches ***A*** and ***B*** are in the same position; when ***A*** and ***B*** are in different positions, the light is to be controlled by switch ***C***.

(a) Draw up a truth table for this situation.

(b) Represent the light function Y in terms of ***A***, ***B*** and ***C***.

(c) Simplify the function using the Boolean theorems and laws, hence **design** the practical switching circuit.

[Problem 4]

Simplify the following expressions using Boolean theorems and laws:

(a) $Y = A\cdot B\cdot C + A\cdot B\cdot \overline{C} + A\cdot \overline{B}\cdot C + A\cdot \overline{B}\cdot \overline{C} + \overline{A}\cdot B\cdot C + \overline{A}\cdot B\cdot \overline{C} + \overline{A}\cdot \overline{B}\cdot \overline{C} + \overline{A}\cdot \overline{B}\cdot C$;

(b) $Y = (\overline{A}+B+\overline{C})\cdot(\overline{A}+B+C)\cdot(C+D)\cdot(C+D+E)$.

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