

**MEC 3102 – PRODUCTION ENGINEERING I
AND
ELECTRICITY & ELECTRONICS II**

Name: Mr. Munkombwe Boyd,

Old School of Engineering Blg.,

Cell: 0968315273/0950435239

Email: boyd.munkombwe@unza.zm

2nd Series Assignment [3]

[Problem 1]

- (a) Write in binary decimal numbers 23 and 31.
- (b) Write in decimal the binary numbers 01010 and 10101.
- (c) Convert the decimal number 82.75 to the hexadecimal equivalent.

[Problem 2]

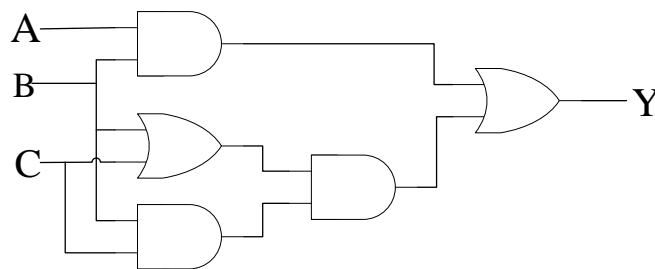
- (a) Using signed 2's complement notation, express as 8-bit words the decimal numbers 25, 121, -17, and -96.
- (b) Hence, show in binary notation the arithmetic operations: $121 - 25$, $25 + (-17)$, and $25 - 96$.
- (c) Explain briefly how subtraction is accomplished using 2's complement notation.

[Problem 3]

- (a) Multiply the numbers $(13.5)_{10}$ and $(2.5)_{10}$ directly and using their binary equivalents.
- (b) Divide $(100.0001)_2$ by $(10.1)_2$ correct to two binary places.

[Problem 4]

From the three-input logic gate shown below, find the expression for the output **Y** and simplify the expression.



[Problem 5]

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 6]

Simplify the following expressions using Boolean theorems and laws:

- (a) $Y = A \cdot B \cdot C + A \cdot B \cdot \bar{C} + A \cdot \bar{B} \cdot C + A \cdot \bar{B} \cdot \bar{C} + \bar{A} \cdot B \cdot C + \bar{A} \cdot B \cdot \bar{C} + \bar{A} \cdot \bar{B} \cdot \bar{C} + \bar{A} \cdot \bar{B} \cdot C$;
- (b) $Y = (\bar{A} + B + \bar{C}) \cdot (\bar{A} + B + C) \cdot (C + D) \cdot (C + D + E)$.
- (c) Simplify the expression $Y = A \cdot \bar{B} \cdot C + A \cdot \bar{B} \cdot \bar{C} + A \cdot B \cdot C + A \cdot B \cdot \bar{C} + \bar{A} \cdot B \cdot C$ using the Karnaugh map method. **Draw** the simplified logic circuit.

[Problem 7]

Construct the K-map for the function $f = \overline{A}BCD + \overline{A}BC + \overline{A}\overline{B}C + BCD$ and find the min-term expression.

NOTE: This assignment is due on the **25/08/2021**