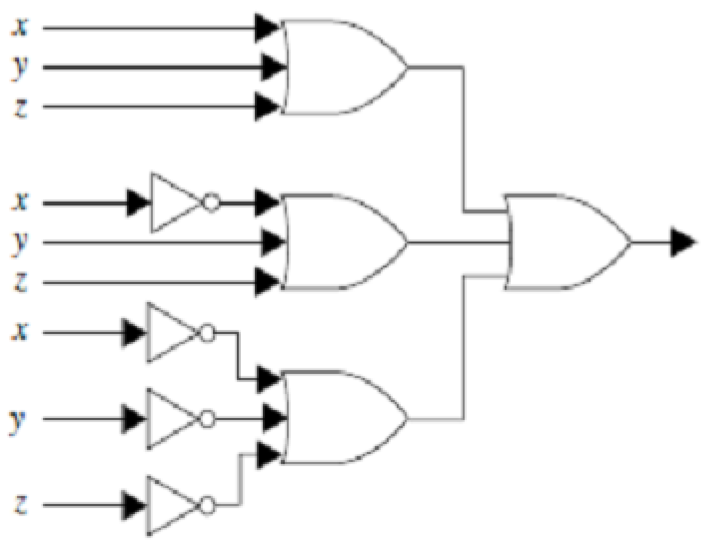
Assignment 2

Question 1

a) Simplify $\overline{(A+\bar{C})(\overline{A+\bar{B}})}$ and draw the resulting gate **[6]**

b) Prove that ***(P→ Q) ^ (R → Q) ⇔ (P v R) → Q*** **[7]**

c) Determine the output of the gate below **[5]**



d) Given the systems of equation below , solve for x , y and z **[6]**

$$\begin{aligned} 5x &-2y &+3z &= 1 \\ 3x &+4y &-2z &= 7 \\ 7x &+2y &-z &= -5 \end{aligned}$$

e) Find the inverse of H = $\begin{pmatrix} 7 & 2 & 1 \\ 0 & 3 & -1 \\ -3 & 4 & -2 \end{pmatrix}$ **[7]**

f) Given that matrix A = $\begin{bmatrix} 2 & -3 \\ 0 & 2 \\ 7 & -2 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -2 & 0 \\ 5 & 1 & 1 \end{bmatrix}$. Evaluate **2(A.B$^{T)}$**. **[5]**

g) Use NAND gates **only** to represent the function *f(A, B , C ,D)* = **(A^B) V (C^D)** **[6]**

Question 2

a) Show that the relations R on the set A= {1, 2, 3, 4, 5} given by R = {(a, b): **a-b** is even is an equivalence relation. **[4]**

b) Simplify $\overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C} + A.B.C$ **[3]**

c) Find a matrix A such that AB = C. Given that B = $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}$ and C = $\begin{pmatrix} -2 & -3 \\ 6 & 2 \end{pmatrix}$ **[5]**

d) Use Boolean algebra to simplify the following expression, then draw a logic gate circuit diagram for the simplified expression. (A + B)(¬A+ ¬B) **[5]**

e) Prove that $A + \overline{A}B = A + B$ **[3]**