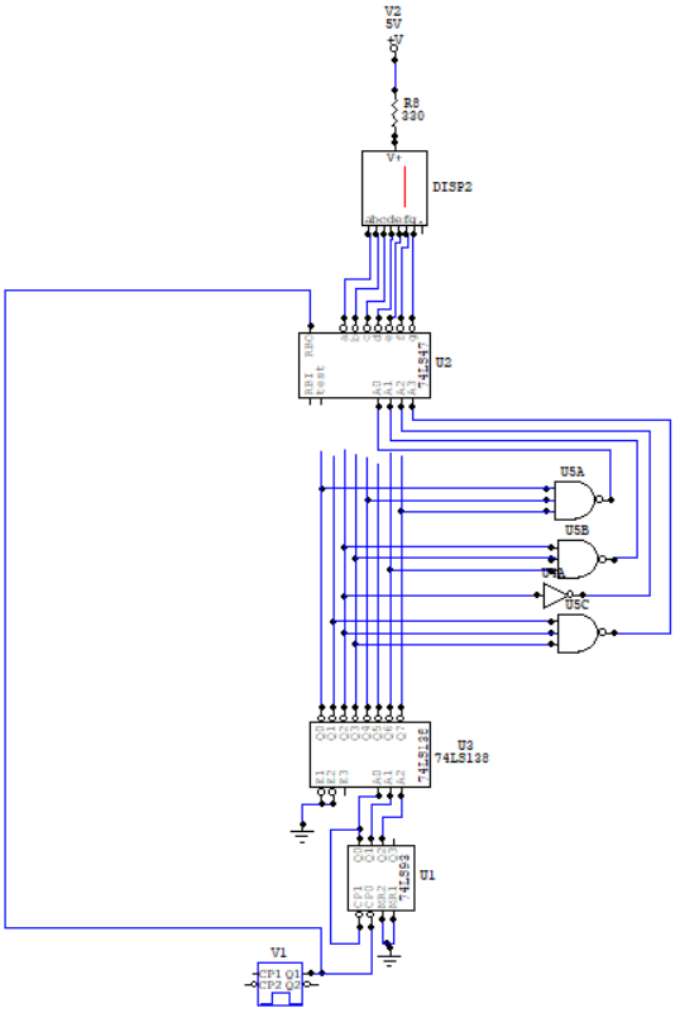
Digital Electronics Circuits lab

Lab Experiment:3

Name:Harshavardhan Alimi
Roll No:18EC10021

AIM: To display our roll number using the 7-segment display,IC 74138(Decoder) and IC 7493(counter).

Circuit:Digital circuit for displaying the roll number-18EC1021

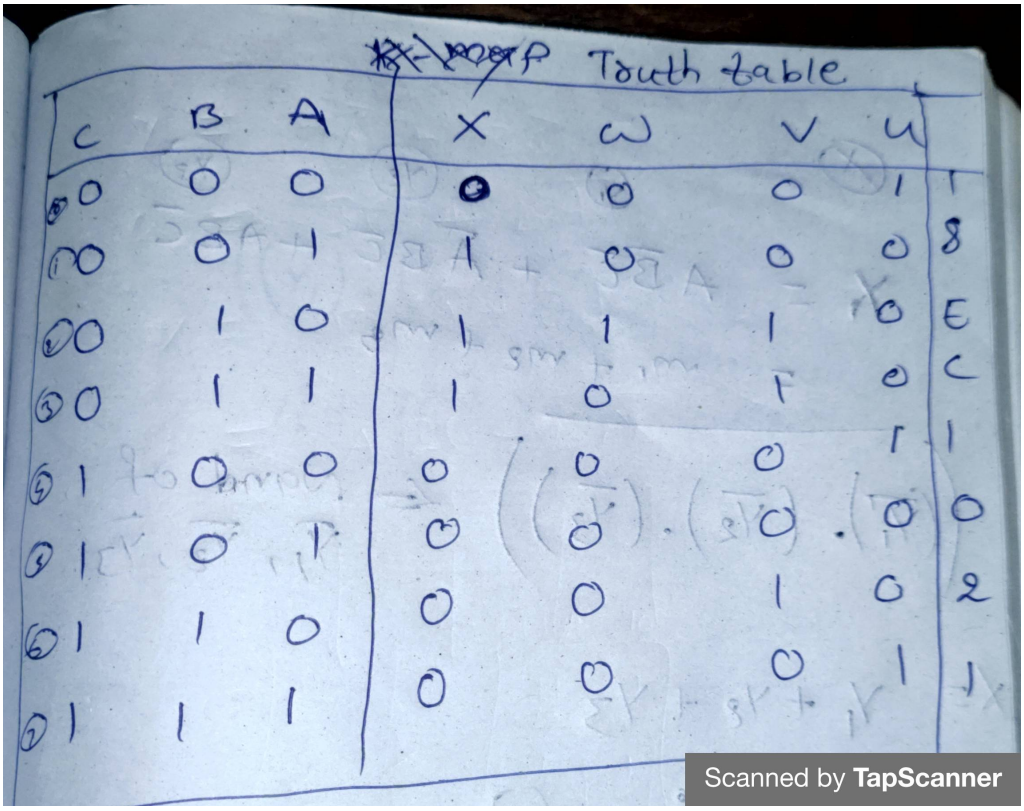


Result:

Link for the above circuit:
https://drive.google.com/file/d/1ad0r_Ck-XqECeAto6i-IlRKpMhY3MYrP/view?usp=sharing

Link for the simulation output of the above circuit:
https://drive.google.com/file/d/1oRBJO33-hDQNV6dY5QIDaxQ06YR6w9w9/view?usp=sharing

Calculations:



(X) (Y1) O (Y2) (Y3)

$X = A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C}$

$= m_1 + m_2 + m_3$

$\overline{\left((\bar{Y_1}).(\bar{Y_2}).(\bar{Y_3})\right)}$ ← Nand of $\bar{Y_1}, \bar{Y_2}, \bar{Y_3}$

$X = Y_1 + Y_2 + Y_3$

→ (Y2)

$\omega = (\bar{A}B\bar{C})$

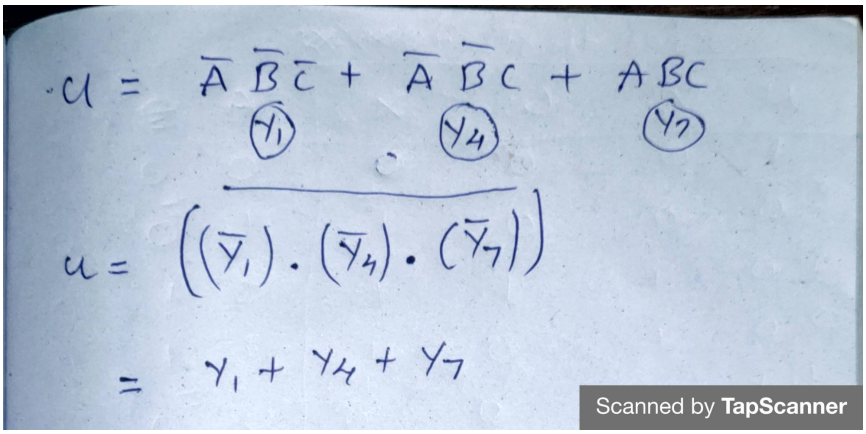
$\omega = \overline{(\bar{Y_2})} = Y_2$

→ (Y2) (Y3) (Y6)

$V = \bar{A}B\bar{C} + AB\bar{C} + \bar{A}BC$

$V = \overline{\left((\bar{Y_2}).(\bar{Y_3}).(\bar{Y_6})\right)}$

$= Y_2 + Y_3 + Y_6$



Observations & Discussion:

- It is the extension for the experiment.2,In the experiment 2 circuit we will be replacing black box(which contains the circuit specifically for my roll no:18EC1021) which is inserted between the IC7447 and IC7493(counter) with the 74138 and some logic gates.
- From the output of 7493 we will be considering the a0,a1,a2 outputs which gives the values range from 000 to 111(8 different outputs),leaving aside the a3 output.
- For each value in these 8 outputs we will assign my 8 digit roll no.as given in the figure of calculation.
- IC 74318 a 3-to-8 decoder takes the 3-input from IC 7490 and generates a 8-bit output which are compliments of each minterm.
- In IC 74138 as E_1,E_2 are Enable(Active low)inputs,if we give high level to any one of them we will be getting high level at all the 8 outputs,similarly when we give low level to the E_3 we will be getting high level at all the 8 outputs as it is a Enable(Active high)input,so we ground E_1,E_2 and left E_3 as high to get the correct output from the decoder.
- We draw a truth table for A,B,C and each function X,W,V,U to find all the minterms for each function so that correspondingly we can take outputs for each function from the IC 74138(Decoder).
- We have to minimise the number of logic gates to be used for each function(X,W,V,U),so the best way to minimise the number is just using a nand gate as we will be getting (minterm)' from the decoder,so by passing those required minterms to the nand gate will gives the sum of those minterms(using De-morgan's Law).
- I had connected the RBO to pulse to show the blink between 2 displaying digits,this happens because when the clock pulse is in low level then RBO also becomes low which triggers the IC 7447 to give all the outputs off i.e.,no LED blows which is displayed as blink.