Student Name: Karahan Sarıtaş
Student ID: 2018400174

CMPE 240 2021 Experiment 1 Preliminary Work

Truth Table

#	x2	x1	x0	r
0	0	0	0	0
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	1
6	1	1	0	0
7	1	1	1	0

Sum of Products (SOP)

$r = X_2'X_1X_0' + X_2X_1'X_0' + X_2X_1'X_0$

Minimized SOP

$r = X_2'X_1X_0' + X_2(X_1'X_0' + X_1'X_0)$ **[Distributive]**
$= X_2'X_1X_0' + X_2(X_1'(X_0' + X_0))$ **[Distributive]**
$= X_2'X_1X_0' + X_2(X_1'.1)$ **[Complement]**
$= X_2'X_1X_0' + X_2X_1'$ **[Identity]**

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Product of Sums (POS)

$r = (X_2+X_1+X_0)\ (X_2+X_1+X_0')\ (X_2+X_1'+X_0')\ (X_2'+X_1'+X_0)(X_2'+X_1'+X_0')$

Minimized POS

$r = (X_2+X_1+X_0X_0')\ (X_2+X_1'+X_0')(X_2'+X_1'+X_0)(X_2'+X_1'+X_0')$ [Distributive]
$= (X_2+X_1+0)\ (X_2+X_1'+X_0')(X_2'+X_1'+X_0)(X_2'+X_1'+X_0')$ [Complement]
$= (X_2+X_1)\ (X_2+X_1'+X_0')(X_2'+X_1'+X_0)(X_2'+X_1'+X_0')$ [Identity]
$= (X_2+X_1)\ (X_2+X_1'+X_0')(X_2'+X_1'+X_0X_0')$ [Distributive]
$= (X_2+X_1)\ (X_2+X_1'+X_0')(X_2'+X_1'+0)$ [Complement]
$= (X_2+X_1)\ (X_2+X_1'+X_0')(X_2'+X_1')$ [Identity]
$= (X_2+X_1\ (X_1'+X_0'))(X_2'+X_1')$ [Distributive]
$= (X_2+X_1X_1'+\ X_1X_0')(X_2'+X_1')$ [Distributive]
$= (X_2+0+\ X_1X_0')(X_2'+X_1')$ [Complement]
$= (X_2+X_1X_0')(X_2'+X_1')$ [Identity]
$= (X_2+X_1)(X_2+X_0')(X_2'+X_1')$ [Distributive]

Circuit