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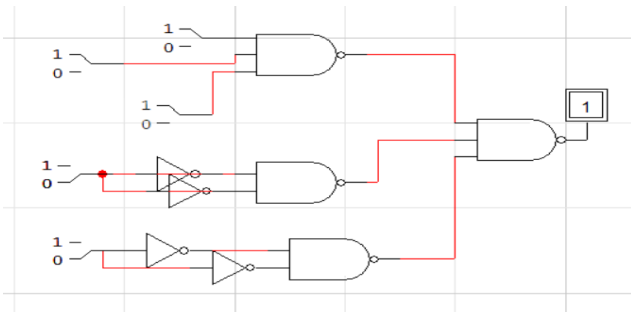
## LAB # 5

### Ques 1.

Design circuit diagram in Logic Works given expressions by using either NAND or NOR gate.

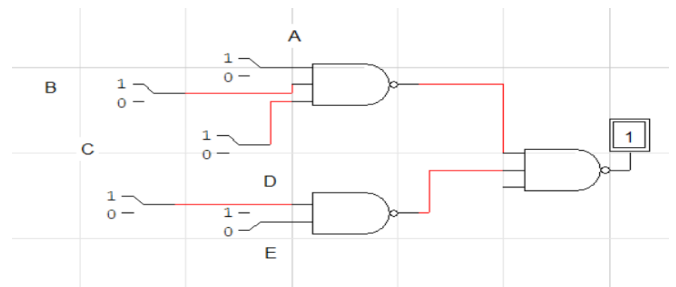
#### 1. $ABC + D' + E'$

$$X = ((ABC + D' + E')')' = ((ABC)' \cdot (D')' \cdot (E')')'$$



#### 2. $ABC + DE$

$$X = ((A.B.C)' \cdot (D.E)')'$$

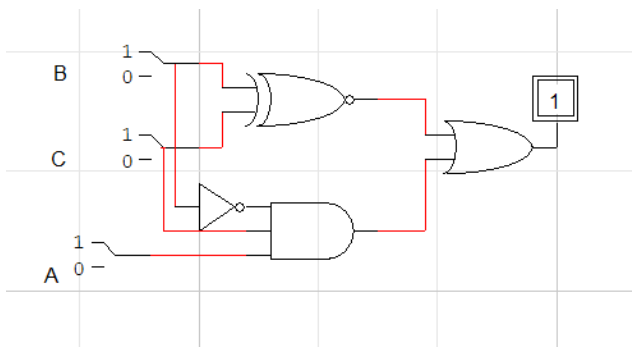


### Ques 2.

Simplify the following Boolean expression: and design circuit in Logic Works.

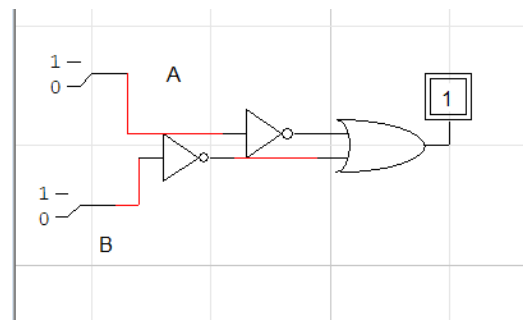
#### 1. $A'BC + AB'C' + A'B'C' + AB'C + ABC$

$$X = BC + B'C' + AB'C = (B \oplus C)' + AB'C$$



#### 2. $(AB + AC)' + A'B'C$

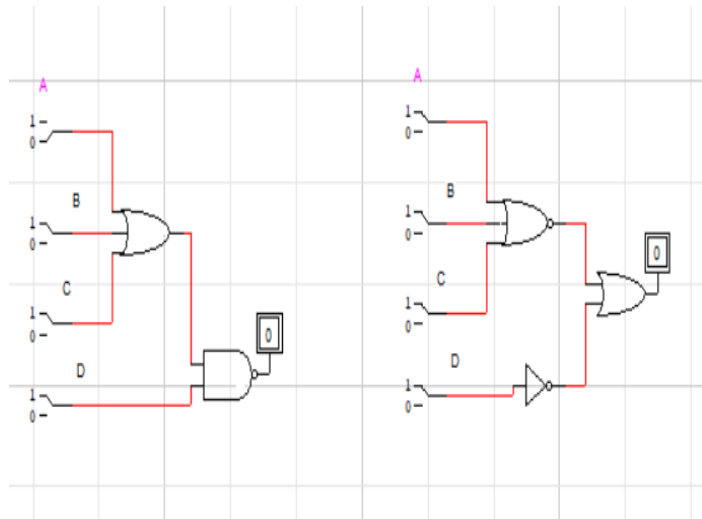
$$X = A' + B'$$



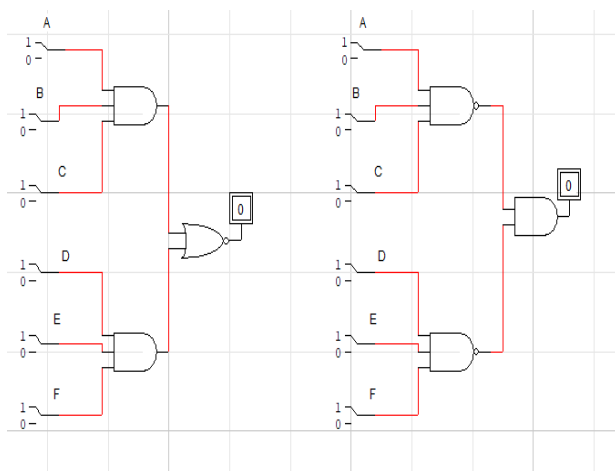
Ques 3.

Apply DeMorgan's theorems to each of the following expression and design circuit diagram on Logic Works

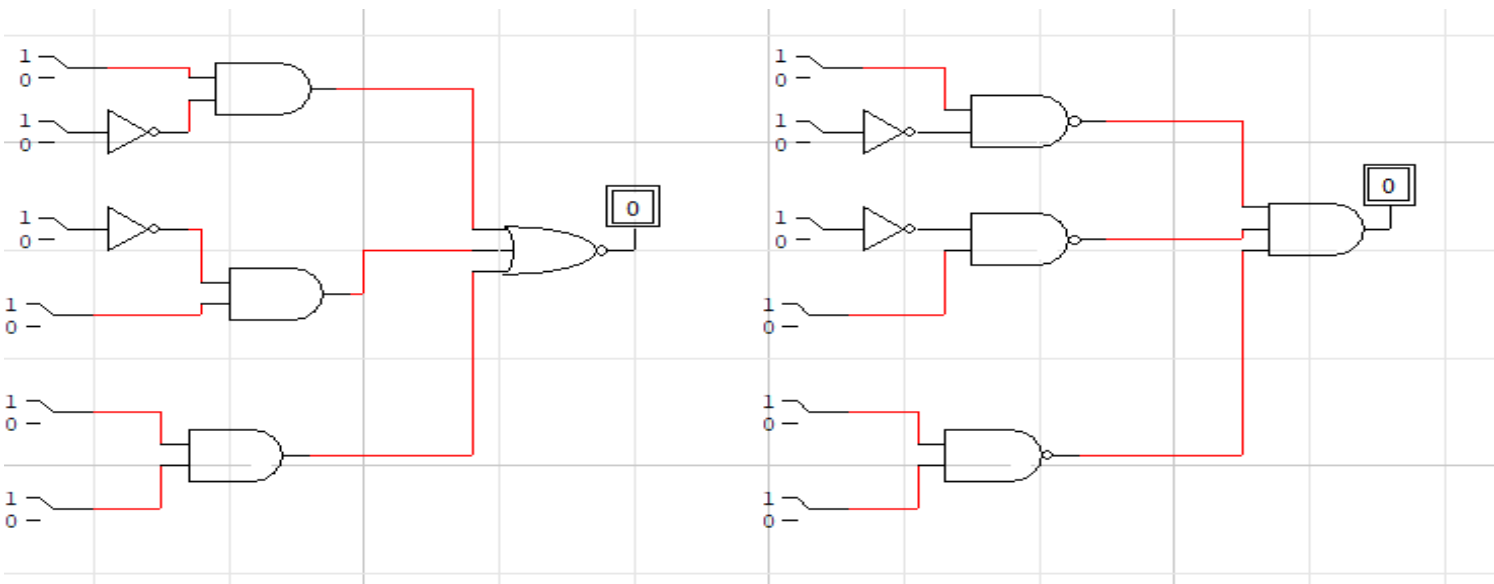
1.  $((A + B + C) D) \sim = (A + B + C)' + D'$



2.  $(ABC + DEF) \sim = (ABC)' \cdot (DEF)'$



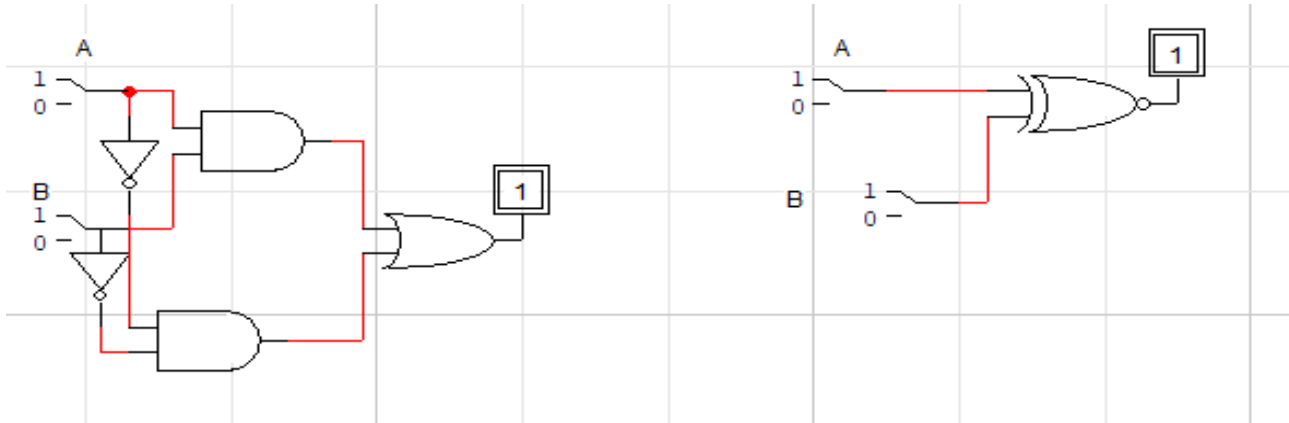
3.  $(AB' + C'D + EF)' = (AB')' \cdot (C'D)' \cdot (EF)'$



#### QUES 4.

The Boolean expression for an exclusive-OR gate is  $AB' + A'B$ . With this as a starting point, use De Morgan's theorems and any other rules or laws that are applicable to design an expression for the exclusive-NOR gate and design circuit in Logic Works.

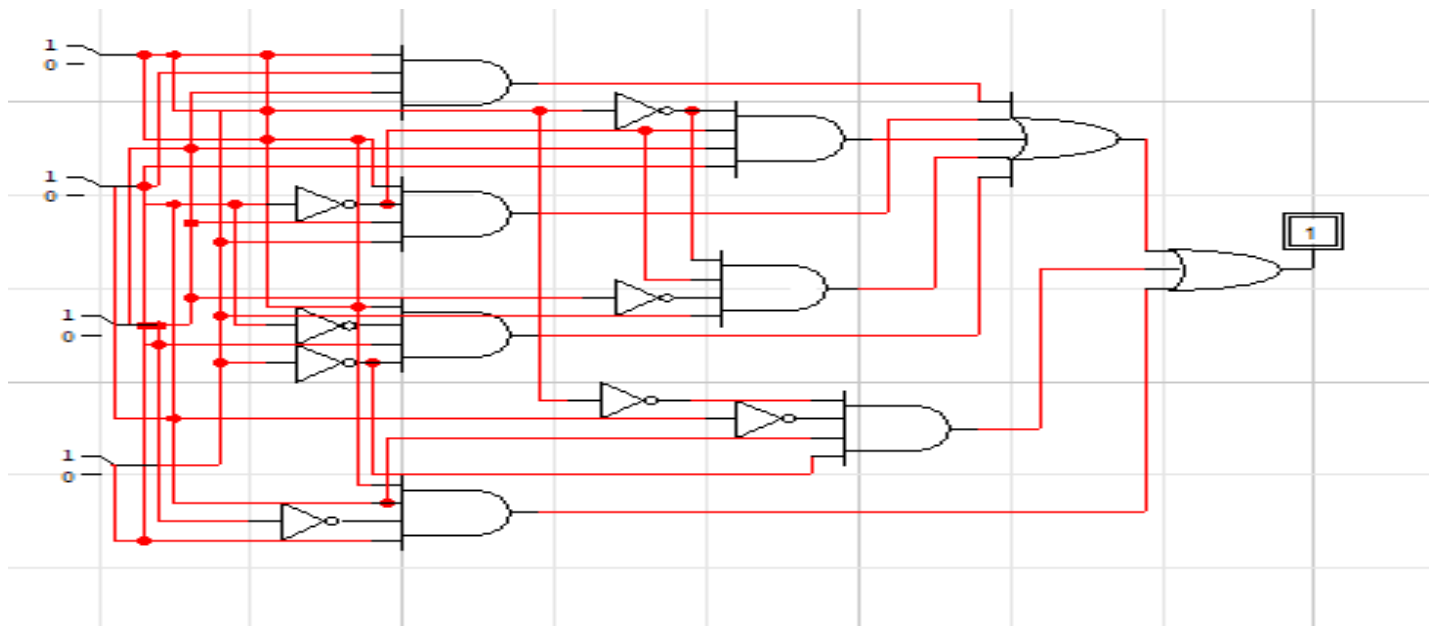
$$AB' + A'B = (AB' + A'B)' = AB + A'B' = \text{EXCLUSIVE-NOR GATE}$$



#### QUES 5

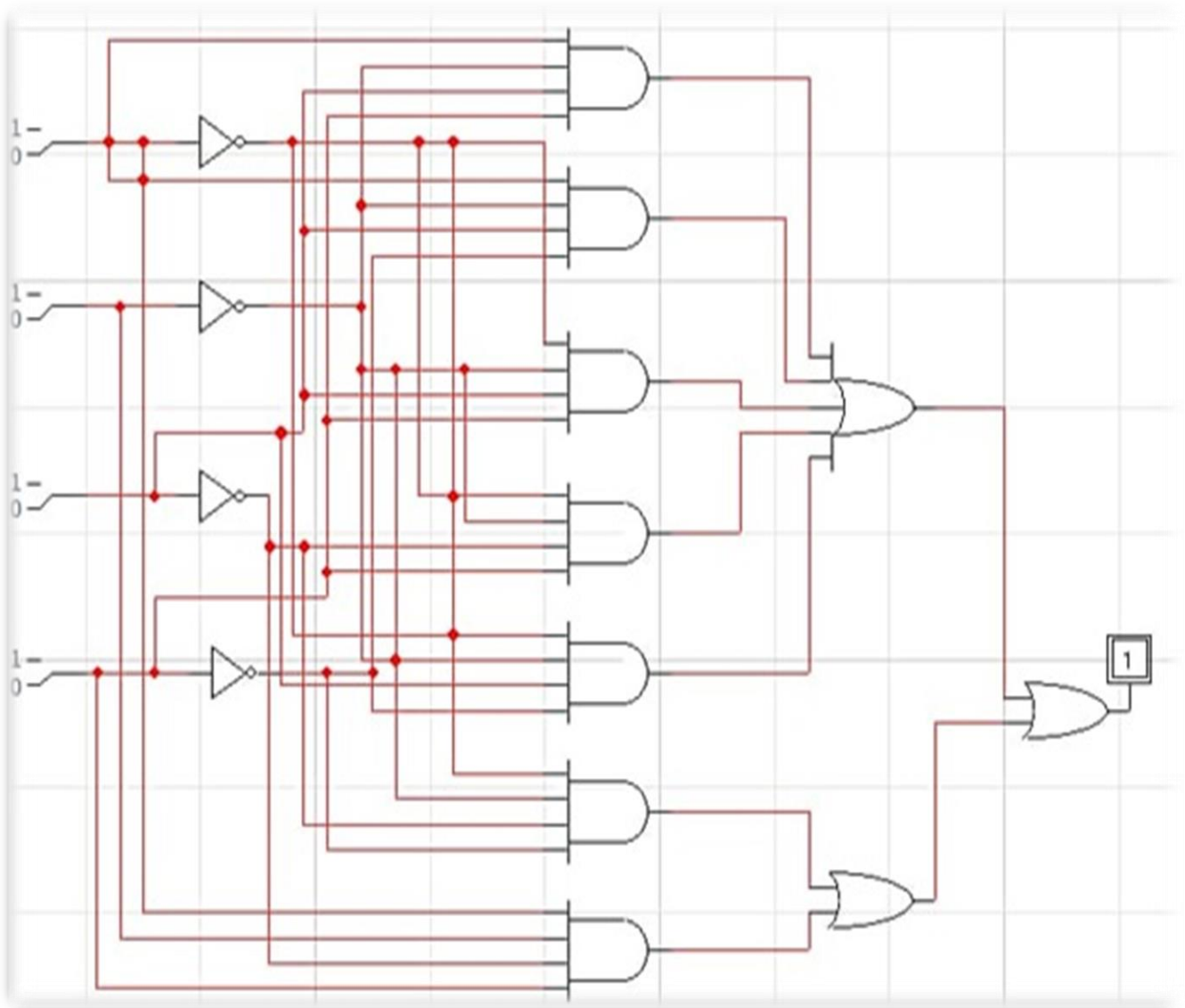
Convert the following Boolean expression into standard SOP form and design circuit diagram in Logic Works:

$$AB'C + A'B'ABC'D = AB'CD + ABCD + AB'CD' + A'B'CD + A'B'C'D + ABC'D + A'B'C'D'$$



QUES 6.

Convert the following Boolean expression into standard POS form and design circuit diagram in Logic Works.  **$AB'C + A'B' + ABC'D$**



Ques 7.  $A'B'C + AB'C' + ABC$

Truth table of the expression given below.

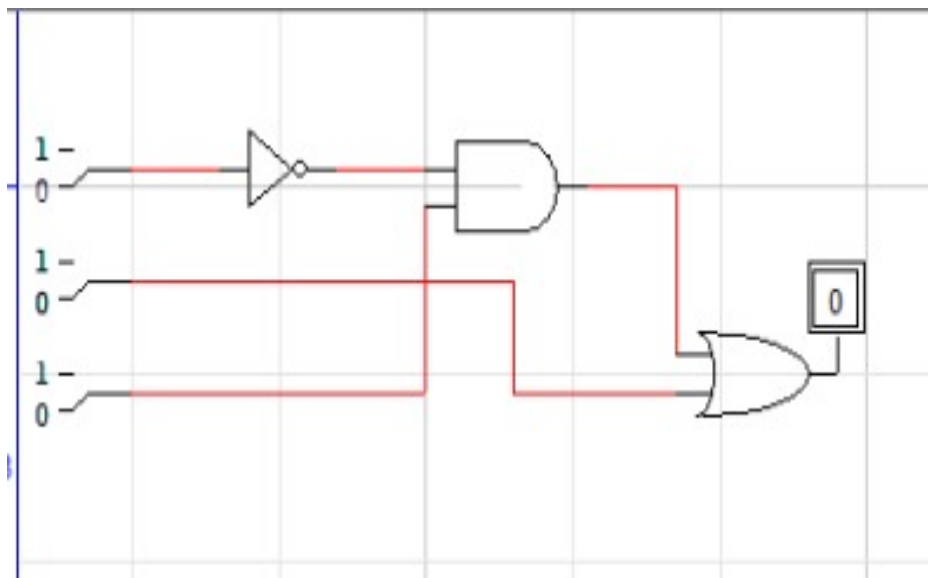
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

**QUES 8.**

Use a Karnaugh map to minimize the following standard SOP expression and design circuit diagram on Logic Works

$$AB'C + A'BC + A'B'C + A'B'C' + AB'C'$$

SIMPLIFIED EXPRESSION:  $A'C + B'$



QUES 9. Use a Karnaugh map to minimize the following standard POS expression and design circuit diagram on Logic Works

$$(A+B+C)(A+B'+C)(A+B'+C')(A'+B+C')(A'+B'+C)$$

SIMPLIFIED EXPRESSION:  $= (A + C)(A+B')(A'+B+C')(B'+C)$

