

# **DLD Lab 06**

(Software)

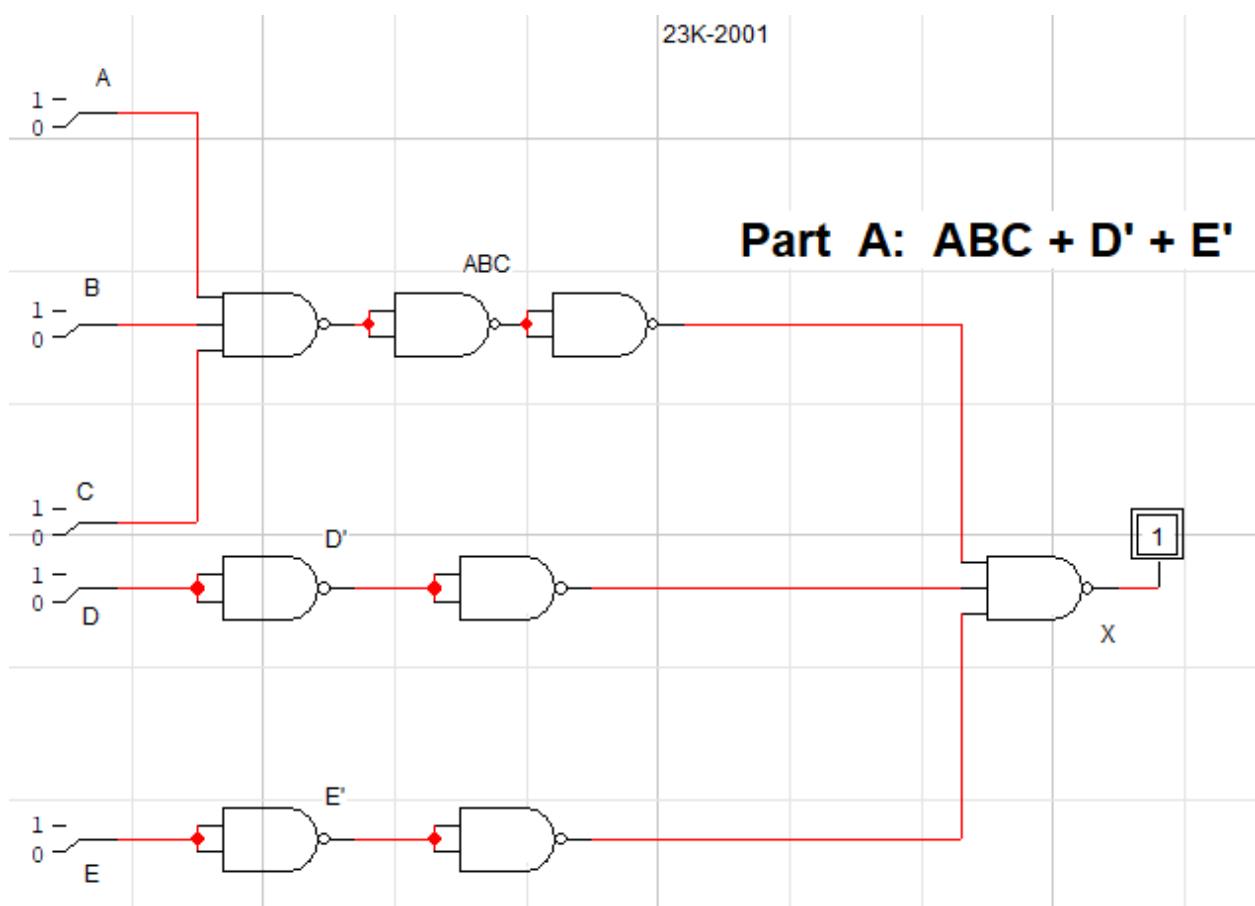
**23K-2001**

**Muzammil Siddiqui**

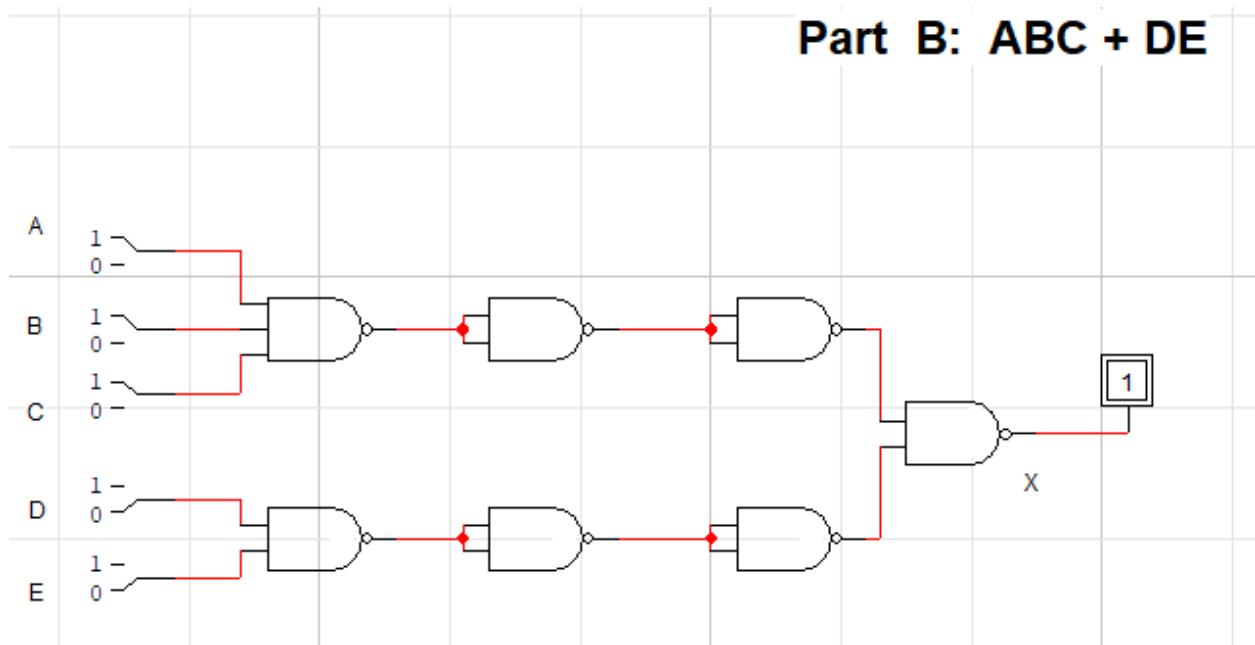
**BCS 2-J**

# Q1.

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Part B:  $ABC + DE$

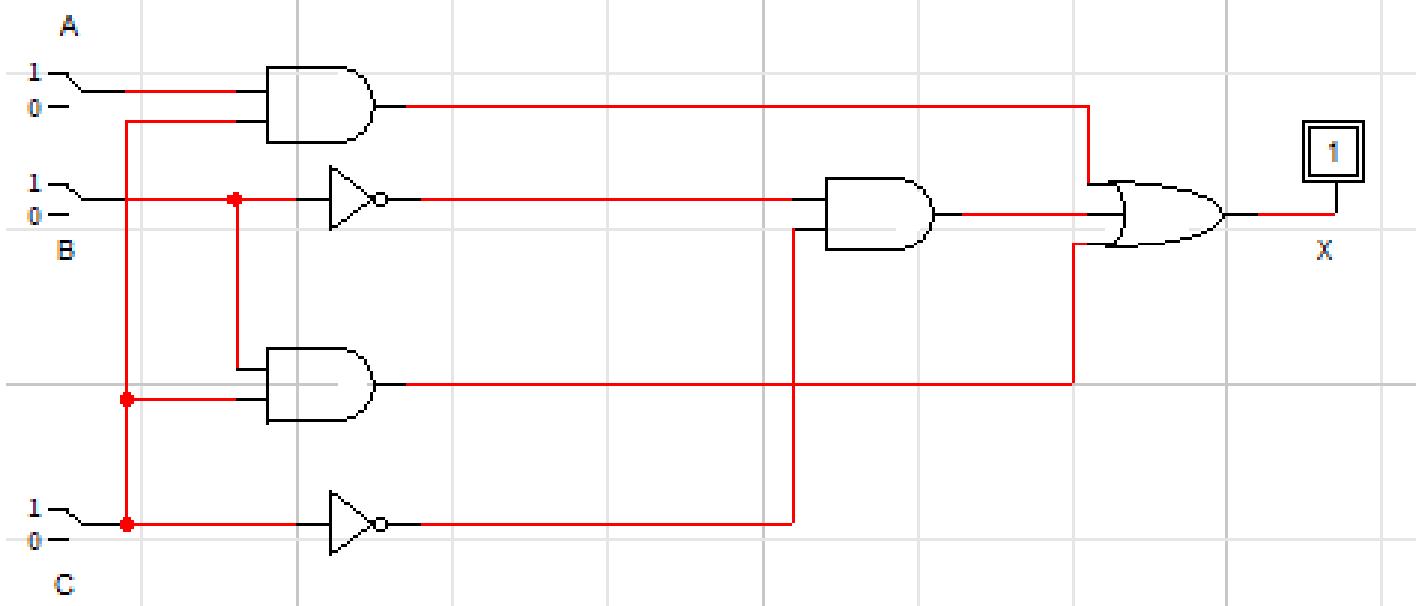


**Q2.**

**Q2**

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$$\begin{aligned} & A'BC + AB'C' + A'B'C' + AB'C + ABC \\ \Rightarrow & BC(A+A') + B'C'(A+A') + AB'C \\ \Rightarrow & BC(1) + B'C'(1) + AB'C \\ \Rightarrow & BC + B'C' + AB'C \\ \Rightarrow & C(B+AB') + B'C' \\ \Rightarrow & C(A+B) + B'C' \\ \Rightarrow & AC + BC + B'C' \end{aligned}$$



## Simplification using Boolean Algebra:

Q2.

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

$$\Rightarrow BC(A' + A) + B'C'(A + A') + AB'C$$

$$\Rightarrow BC(1) + B'C'(1) + AB'C$$

$$\Rightarrow C(B + AB') + B'C'$$

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

$$\Rightarrow AC + BC + B'C'$$

### Q3.

1.

1. a.

AB	C	0	1
00	(1)		
01			(1)
11	(1)	(1)	
10			

$$\rightarrow \bar{A}\bar{B}\bar{C} + AB + BC$$

Ans.

Group I: 1s

Group II: 2s

Group III: 3s

b.

AB	C	0	1
00	(1)		(1)
01	(1)		
11		(1)	
10	(1)		(1)

$$\rightarrow \bar{B} + \bar{A}\bar{C} + AC$$

Ans.

Group I: 4s

Group II: 2s

Group III: 3s

2.

a.

AB	CD	00	01	11	10
00		1	1		
01		1	1	1	1
11					
10		1	1		

$$\rightarrow \bar{A}\bar{C} + \bar{A}B + A\bar{B}D$$

Ans.

Group I: 4s

Group II: 4s

Group III: 2s

b.

AB	CD	00	01	11	10
00		1			1
01		1	1		1
11		1	1		1
10		1		1	1

$$\rightarrow \bar{D} + B\bar{C} + A\bar{B}C$$

Ans.

Group I : 8s

Group II : 4s

Group III : 2s

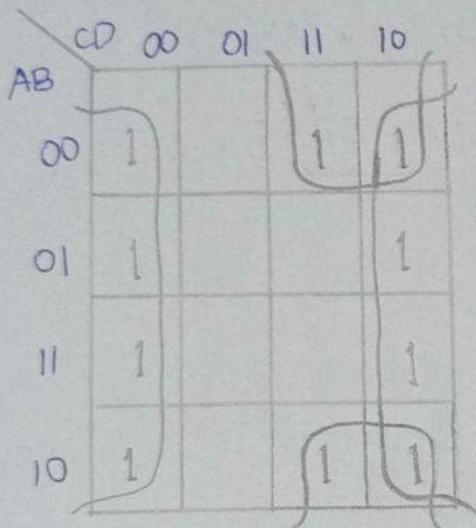
**Q4.**

Simplification:

$$\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + A\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + ABC\bar{D} + A\bar{B}C\bar{D}$$

$\Downarrow$

$$000 + 0100 + 1100 + 0011 + 1011 + 0010 + 0110 + 1110 + 1010$$



Ans.

$$\bar{D} + \bar{B}C$$

Group I : 8s      Group II : 4s

Convert given expression to standard SOP:

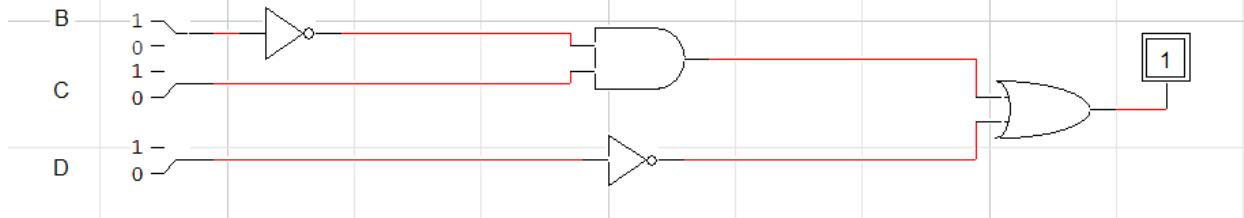
$$\begin{aligned}
 & \bar{B}\bar{C}\bar{D}(A+\bar{A}) + \bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + A\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + ABC\bar{D} + A\bar{B}C\bar{D} \\
 & A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + AB\bar{C}\bar{D} + \bar{A}\bar{B}CD + A\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + ABC\bar{D} + A\bar{B}C\bar{D}
 \end{aligned}$$

$\Downarrow$

$$1000 + 0000 + 0100 + 1100 + 0011 + 1011 + 0010 + 0110 + 1110 + 1010$$

# Q4

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Truth table:

$$X = D' + B'C$$

A	B	C	D	OUTPUT
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

## Q5.

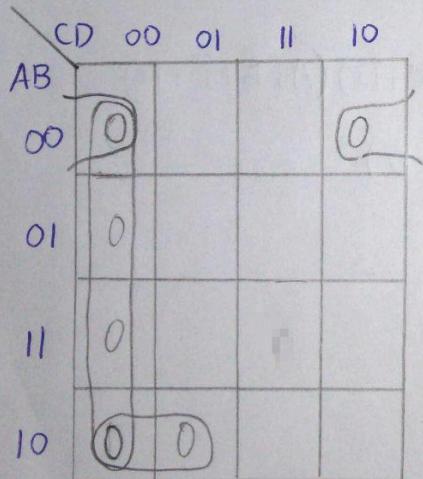
**Q5**

$$(B+C+D)(A+B+\bar{C}+D)(\bar{A}+B+C+\bar{D})(A+\bar{B}+C+D)(\bar{A}+\bar{B}+C+D)$$

First convert to standard: (POS)

$$(B+C+D+A\bar{A})(A+B+\bar{C}+D)(\bar{A}+B+C+\bar{D})(A+\bar{B}+C+D)(\bar{A}+\bar{B}+C+D)$$

$$(A+B+C+D)(\bar{A}+B+C+D)(A+B+\bar{C}+D)(\bar{A}+B+C+\bar{D})(A+\bar{B}+C+D)(\bar{A}+\bar{B}+C+D)$$



$$\rightarrow (C+D)(A+B+D)(\bar{A}+B+C)$$

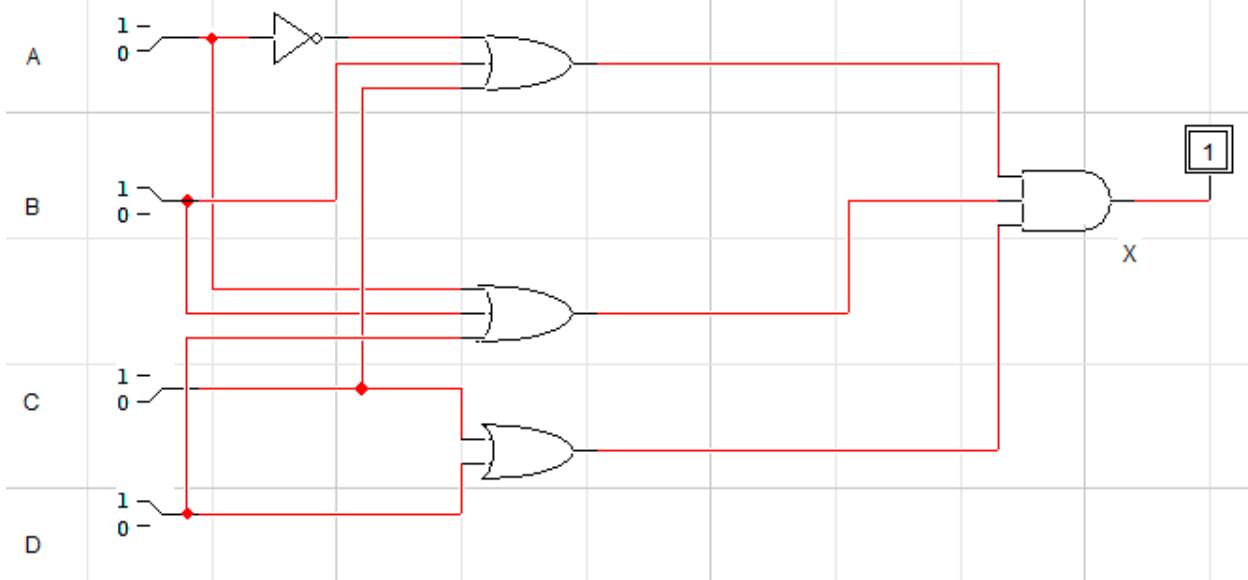
Group 1: 4s

Group 2: 2s

Group 3: 2s

## Q5

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Truth Table:

$$X = (C+D)(A+B+D)(A'+B+C)$$

A	B	C	D	OUTPUT X
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

## Q6.

$$A\bar{B}C + \bar{A}\bar{B} + A\bar{B}\bar{C}D$$

Convert to standard SOP

$$A\bar{B}C(D+\bar{D}) + \bar{A}\bar{B}(C+\bar{C})(D+\bar{D}) + A\bar{B}\bar{C}D$$

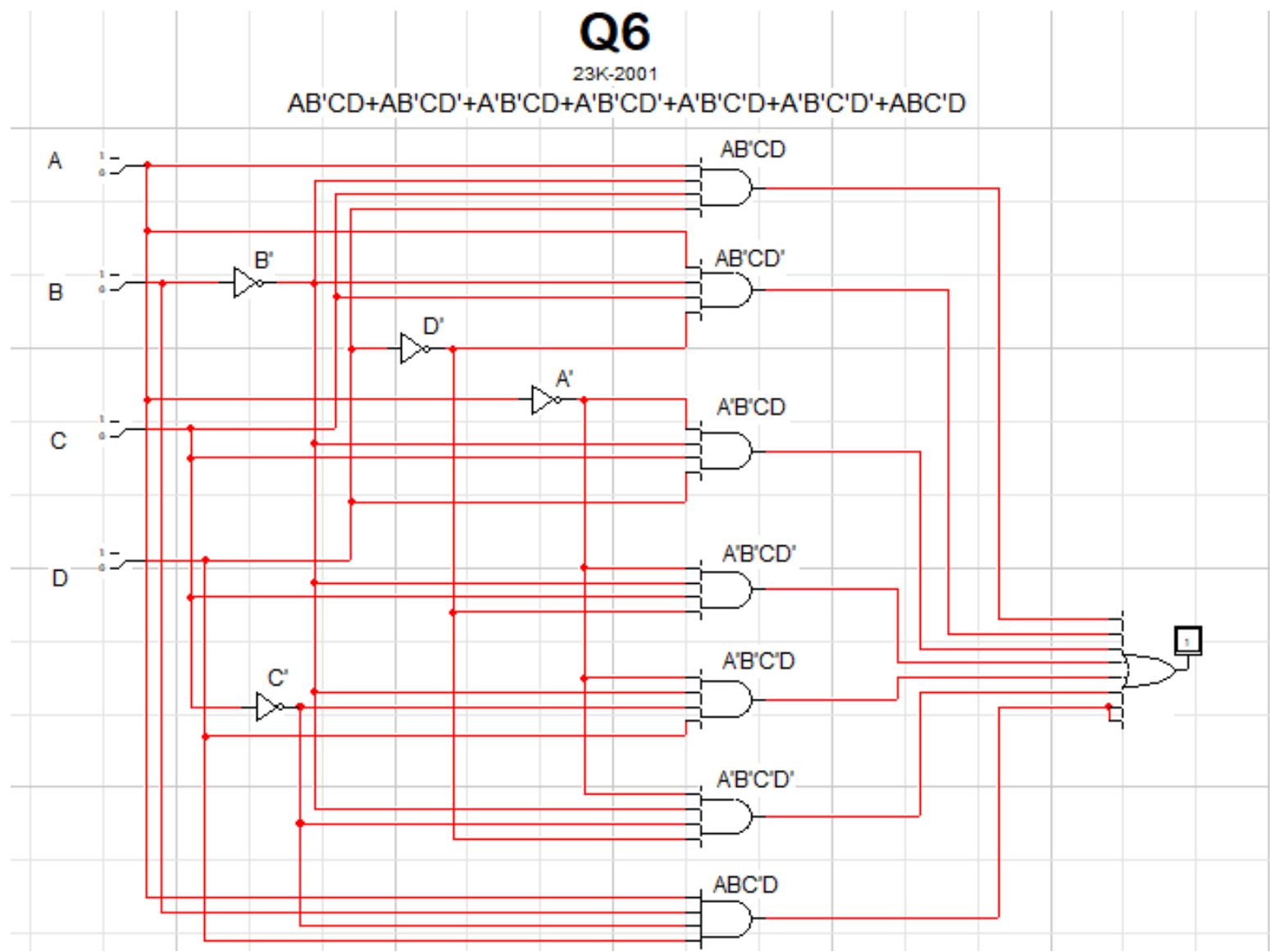
$$A\bar{B}CD + A\bar{B}C\bar{D} + \bar{A}\bar{B}C(D+\bar{D}) + \bar{A}\bar{B}\bar{C}(D+\bar{D}) + AB\bar{C}D$$

$$A\bar{B}CD + A\bar{B}C\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D} + AB\bar{C}D$$

## Q6

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



**Truth Table:**  
**X = A'B' + B'C + ABC'D**

A	B	C	D	OUTPUT X
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

## Q7.

Q7

Convert to standard POS:

$$(A + \bar{B} + C)(\bar{B} + C + \bar{D})(A + \bar{B} + \bar{C} + D)$$

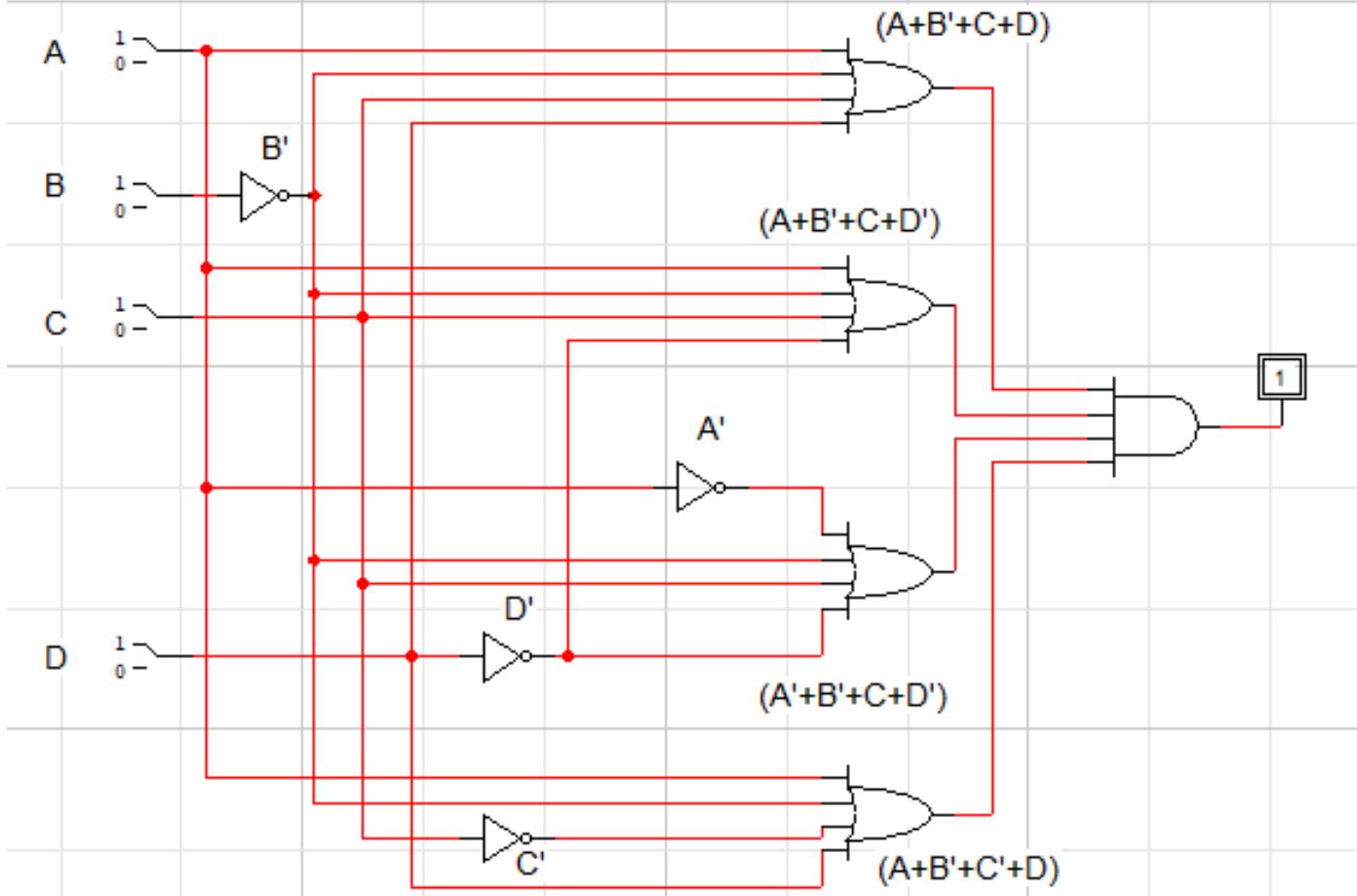
$$\Rightarrow (A + \bar{B} + C + D\bar{D}) (A\bar{A} + \bar{B} + C + \bar{D}) (A + \bar{B} + \bar{C} + D)$$

$$\Rightarrow (A + \bar{B} + C + D)(A + \bar{B} + C + \bar{D})(A + \bar{B} + C + \bar{D})(\bar{A} + \bar{B} + C + \bar{D})(A + \bar{B} + \bar{C} + D)$$

## Q7

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



**TRUTH TABLE:**  
**X = (A+B'+D)(B'+C+D')**

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