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Name:

M. Bilal Elahi

ID:

15484

Department:

Computer science

Assignment #

3

Submitted To:

Sir Muhammad Amin.

(2)

Q1)

$$A + B + C + D = 0$$

when

$$A = 0, B = 0, C = 0, D = 0.$$

Q2)

$$A + B + C + D = 1$$

if either $A = 1, B = 1, C = 1$ or $D = 1$

Q3)

$$ABC = 0.$$

if either $A = 0, B = 0, C = 0.$

Q4)

a)

$$0 + 0 + 0 + 1 = 1$$

b)

$$1 \cdot 0 \cdot 1 \cdot 0 = 0$$

c)

$$1 \cdot 0 \cdot 1 \cdot 0 = 0.$$

d)

$$1 \cdot 0 + 1 \cdot 0 + 0 \cdot 1 + 0 \cdot 1$$

$$0 + 0 + 0 + 0 = 0.$$

(3)

Q 5)

(a)

$$\bar{A} \bar{B} C = 1$$

$$A=0, B=0, \bar{A}=1, \bar{B}=1, C=1$$

(b)

$$\bar{A} + \bar{B} + C = 0.$$

$$A=1, B=1, \Rightarrow \bar{A}=0, \bar{B}=0, C=0.$$

Q 6)

$$(a) \overline{(\bar{A} \bar{B} C)} \overline{(E \bar{F} G)} + \overline{(H \bar{I} J)} \overline{(K \bar{L} M)}$$

$$(\bar{A} + \bar{B} + C) (E + \bar{F} + \bar{G}) (\bar{H} + \bar{I} + \bar{J}) (\bar{K} + \bar{L} + \bar{M})$$

$\downarrow \bar{A} \bar{B} C = \bar{A} + \bar{B} C$

h

$$(b) \overline{(A + B)} \overline{(C + D)} \overline{(E + F)} \overline{(G + H)} = \bar{A} = A.$$

$$\overline{(\bar{A} \bar{B})} \overline{(C \bar{D})} \overline{(E \bar{F})} \overline{(G \bar{H})} = \bar{A} + \bar{B} = \bar{A} \bar{B}$$

Q 7)

$$(a) = (A \bar{B}) + C.$$

(b)

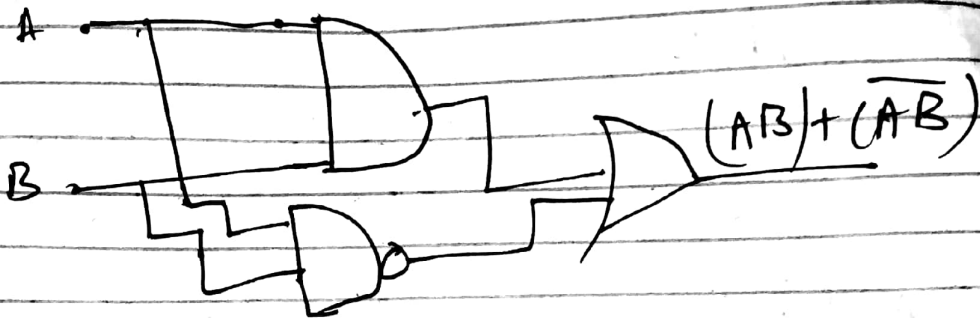
$$= (\bar{A} \bar{B}) \text{ or } (A + \bar{B})$$

(c)

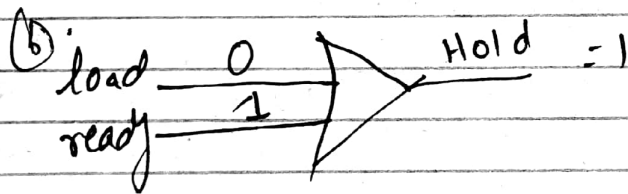
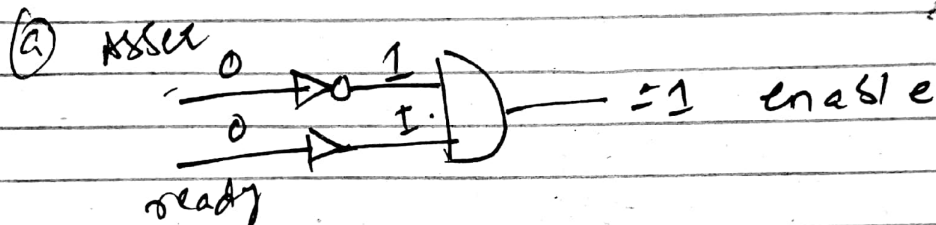
$$(A + B) C.$$

(7)

Q8)



Q9



Q10

(a)

VCR	CAME	RDX	VCR + CAME	(VCR + CAME) RD/
0	0	0	0	0
0	0	1	0	0
0	1	0	1	0
0	1	1	1	0
1	0	1	1	0
1	0	0	1	1
1	1	1	1	1

(b)

(5)

Q11)

(a)

A	B	C	(A+B)	(B+C)	(C+A)	(A+B)(B+C)	(B+C)
0	0	0	0	0	0	0	0
0	0	0	0	1	1	0	0
0	1	1	1	1	0	1	0
0	1	1	1	1	0	1	0
1	0	1	1	1	1	0	1
1	0	1	1	0	1	1	1
1	1	1	1	1	1	1	1

(b)

A	B	C	\bar{A}	\bar{B}	\bar{C}	$\bar{A}B$	$\bar{B}C$	$\bar{C}A$	$\bar{A}B + \bar{B}C + \bar{C}A$	$\bar{A}B + \bar{B}C + \bar{C}A$
0	0	0	1	1	1	0	1	0	0	0
0	0	1	1	0	1	1	0	1	1	1
0	1	0	1	1	0	0	1	0	1	1
0	1	1	1	0	1	0	0	0	1	1
1	0	0	0	1	1	0	0	1	1	1
1	0	1	0	0	1	0	1	1	0	1
1	1	0	0	0	1	0	0	1	1	1
1	1	1	0	0	0	0	0	0	0	0

Q12)

(a)

$$A(A+B)$$

$$AA + AB$$

$$A + AB \quad \rightarrow AA = A \quad \text{Rule 7.}$$

$$A = A + AB = A \quad \text{rule 10}$$

(b)

$$A(A+B) = A + A\bar{B} = A + AB$$

$$AA + AB \quad \text{Distributive Law}$$

$$A + A\bar{B} = \text{Rule 7}$$

$$A = \text{Rule 10.}$$

(6)

(c) $BC + \bar{B}C$

$C = C = A + \bar{A} = 1$ Rule 6.

$C = AA = A$ Rule 7.

(d)

Same as b.

(9)

$BCD [BC + CD\bar{B} + B\bar{D}\bar{C}]$ Distributive law

$BCD [BC + C(0) + B(0)] = 0$ Rule 6
 $A(0) = 0$

$BCD(BC)$

$BCD \cdot BC$

$BCD \cdot ABC$

(10)

$A\bar{B} + (1+C) + A\bar{B}CD + A\bar{B}\bar{C}D = A\bar{B}$

$A\bar{B}(1) + A\bar{B}(C) + A\bar{B}CD + A\bar{B}\bar{C}D$ $1+C=1$ Rule 2

$A\bar{B}(1+CD) + A\bar{B}CDE$ $A\bar{B}$ common

$(A\bar{B})(1) + A\bar{B}(CDE)$ $1+CD=1$ Rule 2

$A\bar{B}(1+CDE)$ $A\bar{B}$ common

$A\bar{B}(1)$

$A\bar{B}$

Ans.

$1+CDE=1$

(7)

(13)

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

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

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

(14)

(a)

$CA + C\bar{D} + DA + D\bar{D}$
 $C\bar{D} + CA + DA + 0 = D\bar{D} = 0$
 $C\bar{D} + AD(1+C) =$
 $C\bar{D} + AD(1) =$
 $(C\bar{D}) + (AD)$

(b)

$AC\bar{D} + A\bar{A}C + C\bar{C}\bar{D} + ACC$
 $A\bar{C}\bar{D} + A\bar{C} + C\bar{D} + AC$
 $A\bar{C}\bar{D} + A\bar{C} + AC + \bar{C}\bar{D}$
 $A\bar{C}(\bar{D} + 1) + C\bar{D} =$
 $A\bar{C}(1) + (C\bar{D})$
 $(A\bar{C}) + (C\bar{D})$

(c)

$B + C(B\bar{D} + (LE + DE))$
 $B + C(CE)$
 $B + CCE$
 $B + CE$

(d)

$A\bar{A}\bar{D} + AC$
 $A\bar{D} + AC$

Q15

(a) $CD + AD$

$$CD = CD(A + \bar{A}) \Rightarrow CDA + C\bar{D}A$$
$$C\bar{D}A + CDA + ADC + ADC$$

(b)

AC is missing D.

$$AC = AC(D + \bar{D}) = ACD + AC\bar{D}$$

$$ACD + AC\bar{D} + C\bar{D}A + CDA$$

(c)

B is missing C AND E

$$B\bar{C}D = B\bar{C}(E + \bar{E}) = B\bar{C}E + B\bar{C}\bar{E}$$

$$B\bar{C}E + B\bar{C}\bar{E} + B\bar{C}E + B\bar{C}\bar{E} + CEB$$

(d)

$A\bar{D}$ is missing C.

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

AC is missing D.

$$A\bar{D}C + A\bar{D}\bar{C} + ACD + AC\bar{D}$$

9

Q16

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

b) $A(C + D) (A + C\bar{D}) (E + P + A) (C + D + \bar{A})$

c) $(B + C + E) (B + C + \bar{E}) (B + \bar{C} + E) (B + \bar{C} + \bar{E})$

d) $(A\bar{D}C) + (A\bar{D}\bar{C}) + ACD + A\bar{C}\bar{D}$

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

Q17

a)

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

b)

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

ACD

Q18

(a)

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

(b)

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

$A + C + D$

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



(c)

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

Q19

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

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

Q20

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

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

		C	
	AB	0	1
00		1	1
10			
11			1
10			

(b)

		B	
	AC	0	1
00			
01			
11		0	1
10			

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

$A\bar{C}$

(c)

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

		C	
	AB	0	1
00		1	1
10		1	1
11			
10			

B

(d)

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

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

$= C$

(12)

(21)

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

		C	0	1
AB	00	0	1	
	01			
	11			
	10			

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

(22)

$$\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + \bar{A}BCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}C\bar{D} + AB\bar{C}\bar{D} + ABC\bar{D} + A\bar{B}\bar{C}D + A\bar{B}CD + AB\bar{C}D + ABCD$$

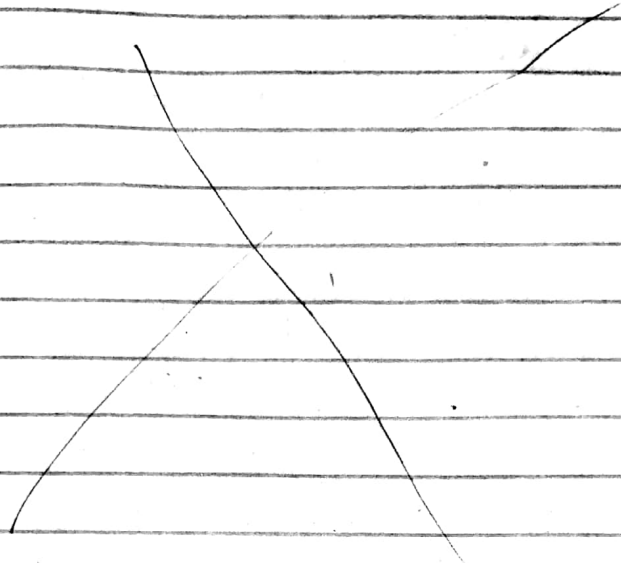
(a)

		00	01	11	10
01	00				
	00	1	1		
	01			1	1
	11	1	1		
	10				1

(b)

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

①



②

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

	AB	C	0	1
	00	0	0	
	01	0	0	
	11			
Z	10			0
	01			

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

(b)

	xy	z	0	1
	00	0	0	
	01	0	0	
	01	0	0	
	11	0	0	
		1		0

$(x+y)(z)(\bar{x}\bar{y})$

(c)

	0	0	
			0

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

Q24

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

AB \ C	0	1
00	0	
01	0	

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

Q25

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

$(A + \bar{B} + C + \bar{D})$ 00 01 11 10

AB \ CD	00	01	11	10
00	0		0	
01	0	0		
11	0	0		0
10		0	0	

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

Q26

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

$A + \bar{B}$ is missing C

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

$A + \bar{C}$ is missing B

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

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

0 1 0 0 1 1 0 0 1 0 0

(15)

$$\textcircled{b} \cdot (\bar{A} + B) (\bar{A} + \bar{B} + \bar{C}) + (B + \bar{C} + D)$$
$$= (A + \bar{B} + \bar{C} + D)$$

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

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

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

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

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

AB	CD	00	01	11	10
00	1	1	0	1	1
01	1	1	1	0	0
11	1	1	1	0	0
10	1	1	1	0	0

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