Workshop Karnaugh maps

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a) $ABC + \bar{A}C$

$Simplified\ Expression$:

$BC + \bar{A}C$

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

b) $(Q + R)(\bar{Q} + \bar{R})$

$Simplified\ Expression$:

$Q\bar{R} + \bar{Q}R$

Q	R	X
0	0	0
0	1	1
1	0	1
1	1	0

c) $ABC + A\bar{B}C + \bar{A}$

$Simplified\ Expression$:

$C + \bar{A}$

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

d) $\overline{RST}(\overline{R + S + T})$

$Simplified\ Expression$:

$\bar{R}\bar{S}\bar{T}$

R	S	T	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

e) $\bar{A}\bar{B}\bar{C} + \bar{A}BC + ABC + A\bar{B}\bar{C} + A\bar{B}C$

$Simplified\ Expression$:

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

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

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

$Simplified\ Expression$:

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

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

g) $(\overline{C+D})+\bar{A}C\bar{D}+A\bar{B}\bar{C}+\bar{A}\bar{B}CD+AC\bar{D}$

$Simplified\ Expression$:

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

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

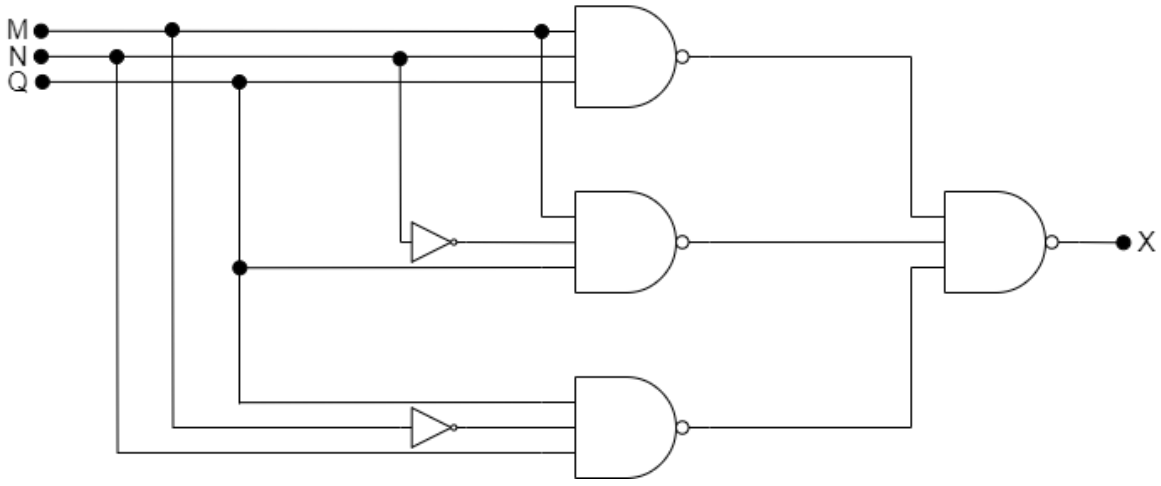
h) $AB(\overline{\bar{C}D})+\bar{A}BD+\bar{B}\bar{C}\bar{D}$

$Simplified\ Expression$:

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

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

2)



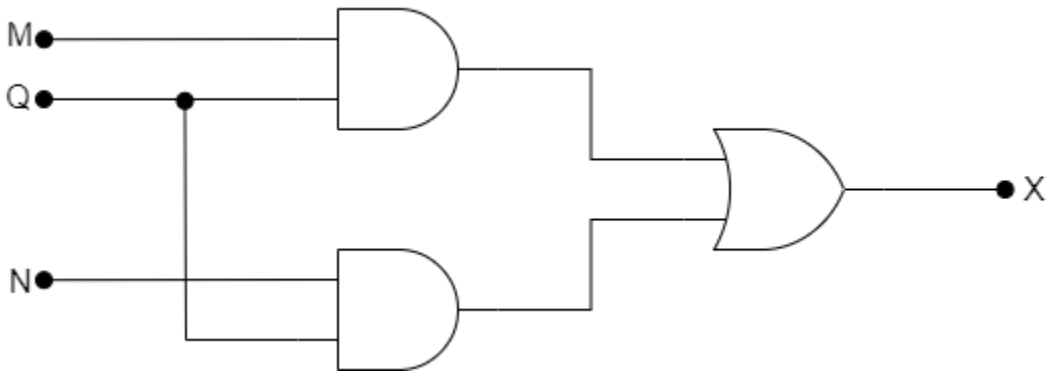
$$X=\overline{((\overline{MNQ})(\overline{M\bar{N}Q})(\overline{\bar{M}NQ})}$$

Simplified Expression

M	N	Q	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

	$\bar{N}\bar{Q}$	$\bar{N}Q$	NQ	$N\bar{Q}$
M	0	1	1	0
$\bar{M}$	0	0	1	0

$$X = (MQ) + (NQ)$$

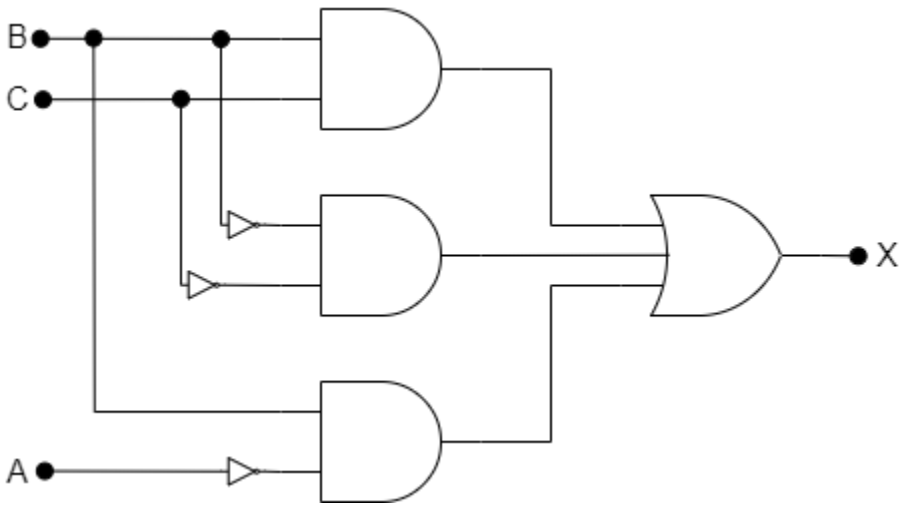


3)

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

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

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

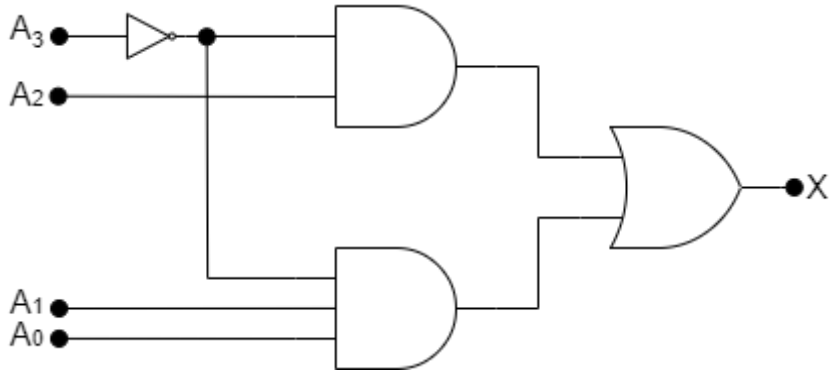


4)

A_3	A_2	A_1	A_0	X
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	1
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	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

	$\overline{A_3}\,\overline{A_2}$	$\overline{A_3}\,A_2$	$A_3\,A_2$	$A_3\,\overline{A_2}$
$\overline{A_1}\,\overline{A_0}$	0	1	0	0
$\overline{A_1}\,A_0$	0	1	0	0
$A_1\,A_0$	1	1	0	0
$A_1\,\overline{A_0}$	0	1	0	0

$$X = (\overline{A_3}\, A_2) + (A_1 A_0 \overline{A_3})$$

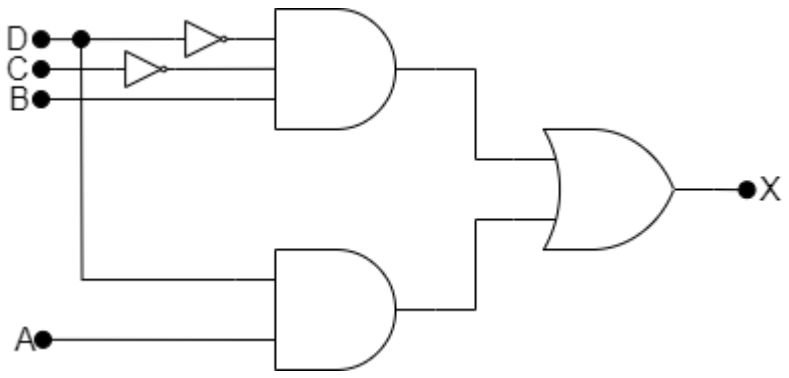


5) a)

D	***C***	***B***	***A***	***X***
0	0	0	0	0
0	0	0	1	0
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	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	x

	$\bar{D}\,\bar{C}$	$\bar{D}C$	DC	$D\,\bar{C}$
$\bar{B}\,\bar{A}$	0	0	0	0
$\bar{B}A$	0	0	1	1
BA	1	0	1	1
$B\,\bar{A}$	1	0	0	0

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



b)

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

	$\overline{D}\,\overline{C}$	$\overline{D}C$	DC	$D\,\overline{C}$
$\overline{B}\,\overline{A}$	0	1	1	1
$\overline{B}A$	0	1	0	0
BA	1	0	0	1
$B\,\overline{A}$	0	0	1	1

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