1

a) $S = AB + \overline{CA}$

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

A	B	C	S
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

A \ BC	00	01	11	10
0	1	1	1	1
1	1	1	1	0

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

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

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

A \ CD	00	01	11	10
0	0	1	0	0
1	1	1	0	0
11	0	1	0	1
10	0	1	0	1

c) $S = ABC\overline{D} + ABC + \overline{AB}\overline{D} + (A + \bar{C})D$

1

A	B	C	D	$AB\bar{D}$	ABC	$\overline{AB}\bar{D}$	$(A+\bar{C})D$	S
0	0	0	0	0	0	1	0	1
0	0	0	1	0	0	1	1	1
0	0	1	0	0	0	1	0	1
0	0	1	1	0	0	1	0	1
0	1	0	0	0	0	1	0	1
0	1	0	1	0	0	1	1	1
0	1	1	0	0	0	1	0	1
0	1	1	1	0	0	1	0	1
1	0	0	0	0	0	1	0	1
1	0	0	1	0	0	1	1	1
1	0	1	0	0	0	1	0	1
1	0	1	1	0	0	1	1	1
1	1	0	0	0	0	1	0	1
1	1	0	1	0	0	0	1	1
1	1	1	0	1	1	1	0	1
1	1	1	1	0	1	0	1	1

1

A \ CD	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1

d) $S = AB + BC + \overline{AC}$

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

A	B	C	AB	BC	$\overline{AC}$	S
0	0	0	0	0	1	1
0	0	1	0	0	1	1
0	1	0	0	0	1	1
0	1	1	0	1	1	1
1	0	0	0	0	1	1
1	0	1	0	0	0	0
1	1	0	1	0	1	1
1	1	1	1	1	0	1

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

e) $S = (B \oplus C)(A + C)$

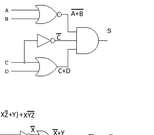
$A\overline{BC}+\overline{B}C$

A	B	C	B⊕C	A+C	S
0	0	0	0	0	0
0	0	1	1	1	1
0	1	0	1	0	0
0	1	1	0	1	0
1	0	0	0	1	0
1	0	1	1	1	1
1	1	0	1	1	1
1	1	1	0	1	0

A \ BC	0	1
00	0	1
01	0	0
11	1	0
10	0	1

2

a) $(\overline{A+B})\times\overline{C}\times(C+D)$

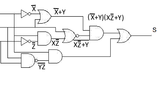


A	B	C	D	$\overline{A+B}$	$\overline{C}$	C+D	S
0	0	0	0	1	1	0	0
0	0	0	1	1	1	1	1
0	0	1	0	1	0	1	0
0	0	1	1	1	0	1	0
0	1	0	0	0	1	0	0
0	1	0	1	0	1	1	1
0	1	1	0	0	0	1	0
0	1	1	1	0	0	1	0
1	0	0	0	0	1	0	0
1	0	0	1	0	1	1	1
1	0	1	0	0	0	1	0
1	0	1	1	0	0	1	0
1	1	0	0	0	1	0	0
1	1	0	1	0	1	1	1
1	1	1	0	0	0	1	0
1	1	1	1	0	0	1	0

A \ BC	00	01	11	10
00	0	0	0	0
01	1	0	0	0
11	0	0	0	0
10	0	0	0	0

$\overline{A}\overline{B}\overline{C}D$

b) $(\overline{X}+Y)(X\overline{Z}+Y)+X\overline{YZ}$

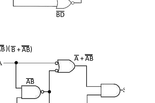


X	Y	Z	$\overline{X}+Y$	$X\overline{Z}+Y$	$(\overline{X}+Y)(X\overline{Z}+Y)$	$\overline{YZ}$	S
0	0	0	1	0	0	1	1
0	0	1	1	0	0	0	0
0	1	0	1	1	1	1	1
0	1	1	1	1	1	0	0
1	0	0	0	1	0	1	1
1	0	1	0	0	0	0	0
1	1	0	1	1	1	1	1
1	1	1	1	1	1	0	0

X \ YZ	00	01	11	10
0	0	0	1	0
1	0	0	0	0

XYZ

c) $A\overline{B}CD + ABCD + \overline{BD}$

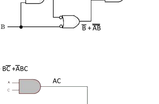


A	B	C	D	$A\overline{B}C\overline{D}$	ABCD	$\overline{BD}$	S
0	0	0	0	0	0	1	1
0	0	0	1	0	0	1	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	1
0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	0	0	0	1	1
0	1	1	1	0	0	1	1
1	0	0	0	0	0	1	1
1	0	0	1	0	0	1	1
1	0	1	0	1	0	1	1
1	0	1	1	0	0	1	1
1	1	0	0	0	0	0	0
1	1	0	1	0	0	0	0
1	1	1	0	0	1	1	1
1	1	1	1	0	1	1	1

A \ CD	00	01	11	10
00	1	1	1	1
01	1	0	0	1
11	1	0	1	1
10	1	1	1	1

$\overline{D} + \overline{B} + AC$

d) $(\overline{X}+\overline{XB})(\overline{X}+\overline{XB})$

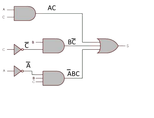


A	B	$\overline{X}+\overline{XB}$	C
0	0	1	1
0	1	1	1
1	0	1	0
1	1	1	1

A \ B	0	1
0	1	0
1	0	1

$\overline{AB} + AB$

e) $AC + B\overline{C} + \overline{A}BC$



A	B	C	AC	$B\overline{C}$	$\overline{A}BC$	S
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	0	1
0	1	1	0	0	1	1
1	0	0	0	0	0	0
1	0	1	1	0	0	1
1	1	0	0	1	0	1
1	1	1	1	0	0	1

A \ BC	00	01	11	10
0	0	1	1	0
1	0	1	1	1