1. Construct a truth table for the following:

a. *(x + y)(x + z)(x′ + z)*

Ans

x	y	z	x'	x + y	x + z	x' + z	(x + y)(x + z)(x + z)
0	0	0	1	0	0	1	0
0	0	1	1	0	1	1	0
0	1	0	1	1	0	1	0
0	1	1	1	1	1	1	1
1	0	0	0	1	1	0	0
1	0	1	0	1	1	1	1
1	1	0	0	1	1	0	0
1	1	1	0	1	1	1	1

2. Show that x = xy + xy '

a. Using truth tables

x	y	y'	xy	xy'	xy + xy'
0	0	1	0	0	0
0	1	0	0	0	0
1	0	1	0	1	1
1	1	0	1	0	1

b. Using Boolean identities

x = xy + xy′ = x(y+y′) # Distributive Law

= x(1) # Inverse Law

= x # Identity Law

Ans ∴ x = xy + xy′

2. Given the function: F*(x,y,z)= xy'z + x'y'z + xyz*

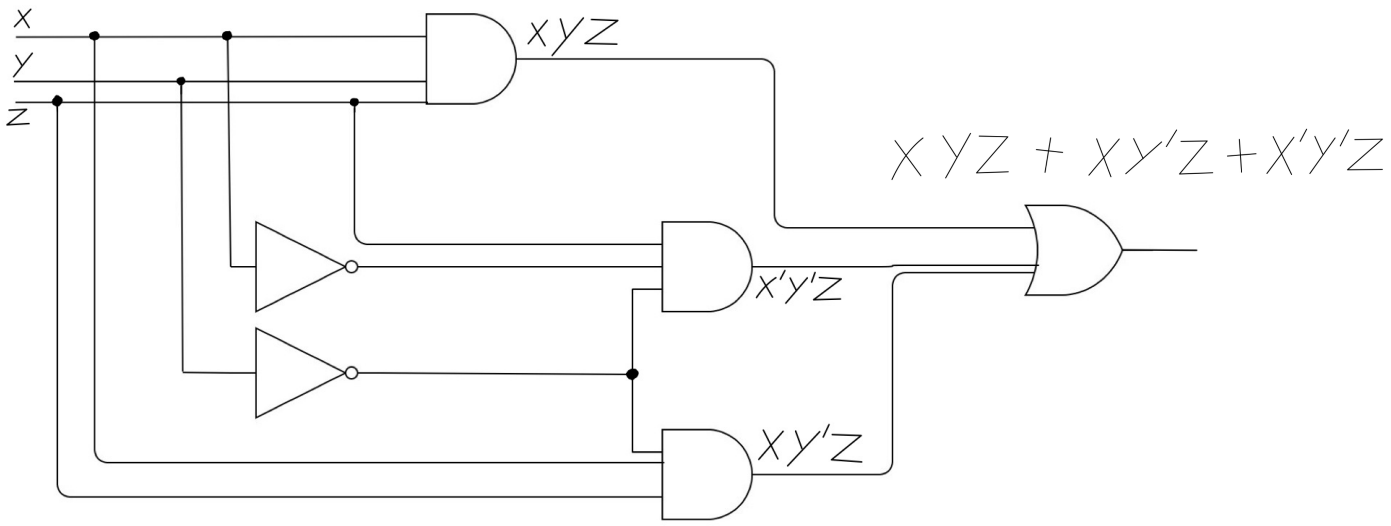
a. List the truth table for F.

Ans

x	y	z	x'	y'	xyz	xy'z	x'y'z	xy'z + x'y'z + xyz
0	0	0	1	1	0	0	0	0
0	0	1	1	1	0	0	1	1
0	1	0	1	0	0	0	0	0
0	1	1	1	0	0	0	0	0
1	0	0	0	1	0	0	0	0
1	0	1	0	1	0	1	0	1
1	1	0	0	0	0	0	0	0
1	1	1	0	0	1	0	0	1

b. Draw the logic diagram using the original Boolean expression

Ans



c. Simplify the expression using Boolean algebra and identities.

Ans

F(x,y,z) = xy'z + x'y'z + xyz # Idempotent Law

= z(xy' + x'y' + xy) # Distributive Law

= z(x(y + y') + x'y') # Commutative & Distributive Laws

= z(x(1) + x'y') # Inverse Law

= z(x + x'y') # Identity Law

= z((x + x')(x + y')) # Distributive Law

= z((1)(x + y')) # Inverse Law

= z(x + y') # Identity Law

= xz + y'z # Distributive Law

d. Simplify the expression using KMap

Ans

x \\ yz	00	01	11	10
0	0	1	0	0
1	0	1	1	0

xy′z xy′z

x′y′z xyz

y'z + xz —> y'z + xz # Simplified

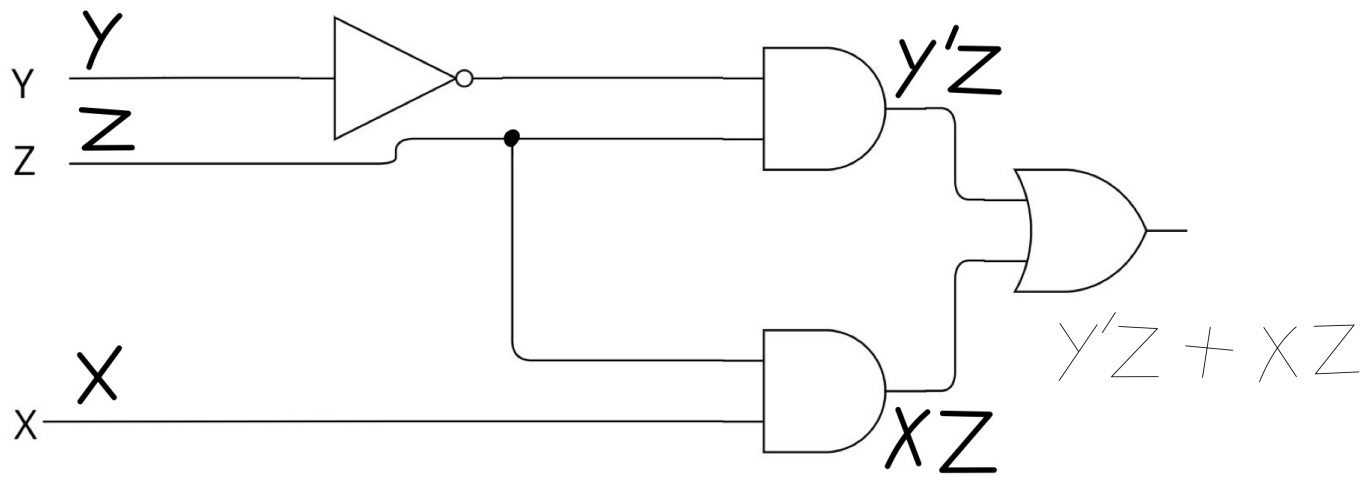
e. List the truth table for your answer in Part d.

Ans

x	y	z	y'	xz	y'z	y'z + xz
0	0	0	1	0	0	0
0	0	1	1	0	1	1
0	1	0	0	0	0	0
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	0	1	1	1	1	1
1	1	0	0	0	0	0
1	1	1	0	1	0	1

f. Draw the logic diagram for the simplified expression in Part d.

Ans



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