Logic design (Fall 2021)
Quiz # 2

Name:_____ID:_____

1. (30%) Simplify the following Boolean expression to a sum of products.

[(A'B+A'C'+B')(C'+D')]'

Ans:

[(A'B+A'C'+B')(C'+D')]'

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

=[(A+B')(A+C)(B)]+CD

=[(A+B'C)(B)]+CD

=(AB+BB'C)+CD

=AB+CD

[(Q'+T'Q+T'R')(R'+S')]'

Ans:

[(Q'+T'Q+T'R')(R'+S')]'

=(Q'+T'Q+T'R')'+(R'+S')'

=[(Q)(T+Q')(T+R)]+RS

=[(Q)(T+Q'R)]+RS

=(TQ+QQ'R)+RS

=TQ+RS

[(X'+Z')(W'Y+W'X'+Y')]'

Ans:

[(X'+Z')(W'Y+W'X'+Y')]'

=(X'+Z')'+(W'Y+W'X'+Y')'

=XZ+[(W+Y')(W+X)(Y)]

=XZ+[(W+Y'X)(Y)]

=XZ+(WY+YY'X)

=XZ+WY

2. (30%) Factor the following Boolean expression to a product of sum.

A+B'E+CD'

Ans:

A+B'E+CD' (because X+YZ=(X+Y)(X+Z))

=(A+B')(A+E)+CD'

=(A+B'+CD')(A+E+CD')

=(A+B'+C)(A+B'+D')(A+C+E)(A+D'+E)

T+PQ'+RS'

Ans:

T+PQ'+RS' (because X+YZ=(X+Y)(X+Z))

=(T+P)(T+Q')+RS'

=(T+P+RS')(T+Q'+RS')

=(T+P+R)(T+P+S')(T+R+Q')(T+S'+Q')

W+YV'+X'Z

Ans:

W+YV'+X'Z (because X'+YZ=(X'+Y)(X'+Z))

=(W+Y)(W+V')+X'Z

=(W+Y+X'Z)(W+V'+X'Z)

=(W+Y+X')(W+Y+Z)(W+X'+V')(W+Z+V')

3. (40%) Prove whether the following two Boolean expressions, G and F, are equal or not by filling the following truth table.

F=(A'+C)(B+AC)   G=A'B+C

Ans:

A	B	C	A'+C	AC	B+AC	F	A'B	G
0	0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0	1
0	1	0	1	0	1	1	1	1
0	1	1	1	0	1	1	1	1
1	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	0	1
1	1	0	0	0	1	0	0	0
1	1	1	1	1	1	1	0	1

The two functions are not equal!!

F=T+R'S   G=(R'+T)(S+RT)

Ans:

R	S	T	R'S	F	R'+T	RT	S+RT	G
0	0	0	0	0	1	0	0	0
0	0	1	0	1	1	0	0	0
0	1	0	1	1	1	0	1	1
0	1	1	1	1	1	0	1	1
1	0	0	0	0	0	0	0	0
1	0	1	0	1	1	1	1	1
1	1	0	0	0	0	0	1	0
1	1	1	0	1	1	1	1	1

The two functions are not equal!!

F=(Y+XZ)(X'+Z)   G=X'Y+Z

Ans:

X	Y	Z	XZ	Y+XZ	X'+Z	F	X'Y	G
0	0	0	0	0	1	0	0	0
0	0	1	0	0	1	0	0	1
0	1	0	0	1	1	1	1	1
0	1	1	0	1	1	1	1	1
1	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	0	1
1	1	0	0	1	0	0	0	0
1	1	1	1	1	1	1	0	1

The two functions are not equal!!