CS-301 Computer Architecture
Assignment 7

Name:_____

1. Given the function $F(X,Y,Z) = X\bar{Y}Z + \bar{X}\bar{Y}Z + XYZ$

   a) Give the truth table for *F*

X	Y	Z		*F* Part (a)		F Part (d)
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

   b) Draw the logic diagram using the original Boolean function. Be Neat!

Logic Diagram for Part (b)	Logic Diagram for Part (c)

   c) Simplify the expression using Boolean algebra and identities or using K-maps. Give the simplified function below and draw the logic diagram for the simplified function above.

   $F(X,Y,Z) =$ _____

   d) Give the truth table for your answer in Part (c). Use the RHS of the table above.

2. Draw the combinational circuit that directly implements the following Boolean function.

$$F(X, Y, Z) = XZ + (XY + \bar{Z})$$

3. We are provided with 256 × 8 RAM chips only.
   a) How many chips are needed to provide a memory capacity of 4096 bytes?

   _____

   b) How many bits will each memory address contain?

   _____

   c) How many address lines must go to each chip?

   _____

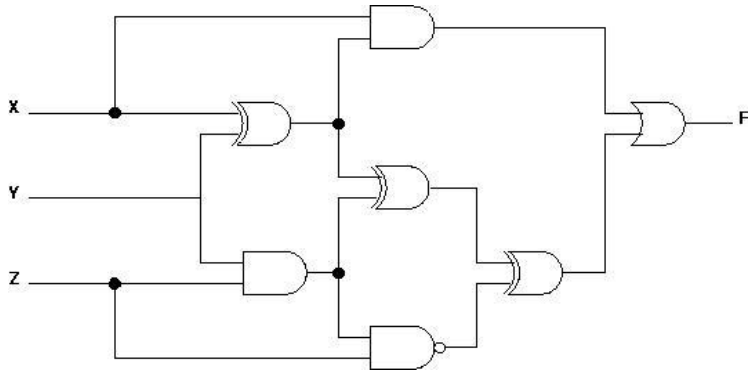
   d) How many lines must be decoded for the chip select inputs?

   _____

   e) Specify the size of the decoder.

   _____

4. Give the truth table that describes the following circuit:



X	Y	Z	F
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

5. A very small company has hired you to install a security system. The brand of system that you install is priced by the number of bits encoded on the proximity cards that allow access to certain locations in a facility. Of course, this small company wants to use the fewest bits possible (spending he least amount of money as possible) yet have all of its security needs met. The first thing you need to do is determine how many bits each card requires. Next, you have to program card readers in each secured location so that they respond appropriately to a scanned card.

   The company has four types of employees and five areas that it wishes to restrict to certain employees. The employees and their restrictions are as follows:

   a. The Big Boss needs access to the executive lounge and the executive washroom.
   b. The Big Boss's secretary needs access to the supply closet, employee lounge, and executive lounge.
   c. Computer room employees need access to the server room and the employees lounge.
   d. The janitor needs access to all areas in the workplace.

   Using the following table, determine how each class of employee will be encoded on the cards and construct logic diagrams for the card readers in each of the five restricted areas. Use the space below to draw your diagrams.

   Hint: The values assigned for the inputs (the card encoding), determine the exact design of each reader.

Encoding	**Employee Class**	**Has authorization to enter:**				
		Supply Room	**Server Room**	**Employees Lounge**	**Executive Lounge**	**Executive Washroom**
00	IT Workers					
01	Secretary					
10	Big Boss					
11	Janitor					