The first 5 Questions are very short answer questions:

1. (3pts) What is the Hamming distance between these two bit pattens: 0111 and 1000?

2. (3pts) How far apart must valid code words be to allow Single Error Detection (SED)?
Single Error Correction (SEC)?
Double Error Correction Triple Error Detection (DECTED)?

3. (3pts) Draw the logic that comprises an SR latch.

4. (3pts) What is the difference between the Mealy and Moore models of sequential design?

5. (3pts) Write the equation for the carry into the 6th adder cell in an ALU using carry-lookahead, in terms of P's and G's.

6. (5 pts) Design a single-bit full adder using 2 4-input Muxes. (A 4-input Mux has 4 data inputs and 2 control lines).

7. (5 pts) Assume you have 8-bit data words, and your memory system supports Single Error Correction. For each of the following patterns recieved from memory identify and correct any errors that may have occurred during transmission or storage. The first one is done for you.

Given: **1 0 1 0 0 1 0 0 0 1 1 0** The Data Word is: **10101001**

Given: **1 0 0 0 0 0 0 0 0 0 0 0** The Data Word is:

8. (25pts) Given the following state transition table, draw the Karnaugh maps for Y1', Y2', and Y3', and Z in terms of X, Y1, Y2 and Y3, and then write minimum boolean equations for each.

Present State			Next State						Output (Z)	
			X=0			X=1			X=0	X=1
Y1	Y2	Y3	Y1'	Y2'	Y3'	Y1'	Y2'	Y3'		
0	0	0	0	0	0	0	0	1	0	0
0	0	1	0	1	0	0	1	1	0	1
0	1	0	1	0	0	1	0	1	0	0
0	1	1	1	1	1	1	0	0	0	1
1	0	0	0	0	1	0	1	0	1	0
1	0	1	0	1	1	0	1	0	0	1
1	1	1	1	0	1	1	1	1	0	1

9. (20pts) Given the following Karnaugh maps, implement the sequential machine using a JK FF for Y1, a RS FF for Y2, and a Toggle FF for Y3. You do not need to draw the gates, but you do need to write down the input equations for each of the inputs of each of the Flip Flops in the circuit.

Y1'

			X		
	1			**1**	
		1	**1**		*Y3*
Y2		**1**	**1**		
	1			**1**	
		Y1			

Y2'

			X		
	1			**1**	
		1	**1**	*d*	*Y3*
Y2	**1**	*d*		**1**	
		1	**1**		
		Y1			

Y3'

			X		
	d				
	1	*d*	**1**	**1**	*Y3*
Y2			*d*		
	1	**1**	**1**	**1**	
		Y1			

10. (30 pts) A vending machine takes nickels, dimes and quarters. Pop is to be dispensed when a total of 30 cents has been deposited. Only one coin can be deposited at a time. Let X1=25 cents, X2=10 cents, and X3=5 cents. Draw the State Transistion Diagram (the circles and the arcs) for this finite state machine. Let S0=nothing deposited (the Start state). Once you have a state transition diagram, assign bit patterns to each state and write down the corresponding state transition table. Assume you are using a Mealy model. Also, label the trasitions on the diagram using the following format:

$$\frac{X1\ X2\ X3}{Z}$$

So, for example,

$$\frac{1\ 0\ 0}{0}$$

would be used to indicate that a quarter was deposited, and the output at that point should be a 0.