

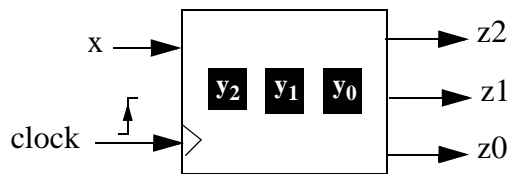


EXAM II
110 MINUTES
WORK ALL PROBLEMS

OPEN BOOK

(35 pts)

1) Consider the following 1-input, 3-output sequential circuit :



The sequential circuit contains **three** flip-flops. FF y_2 is the most significant FF.

The first two analysis steps are already completed. The following are **next** flip-flop output equations and sequential circuit **output** equations :

$$\begin{aligned} \overrightarrow{y_2} &= \overline{x} \overline{y_2} \overline{y_1} + \overline{x} y_2 y_1 + x y_2 \overline{y_1} + x \overline{y_2} y_1 & \overrightarrow{y_1} &= \overline{y_1} & \overrightarrow{y_0} &= y_0 \\ \hline z_2 &= y_2 & z_1 &= y_1 & z_0 &= y_0 \end{aligned}$$

Continue the analysis of the sequential circuit as shown **in class**.

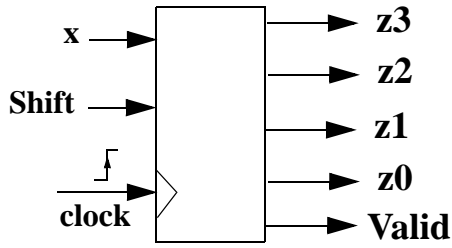
After doing the timing analysis, if you **cannot** figure out the purpose, just write “I cannot determine the purpose.”

Is this circuit a **Mealy** or **Moore** circuit ? Explain why.

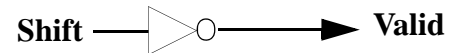
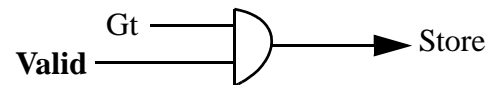
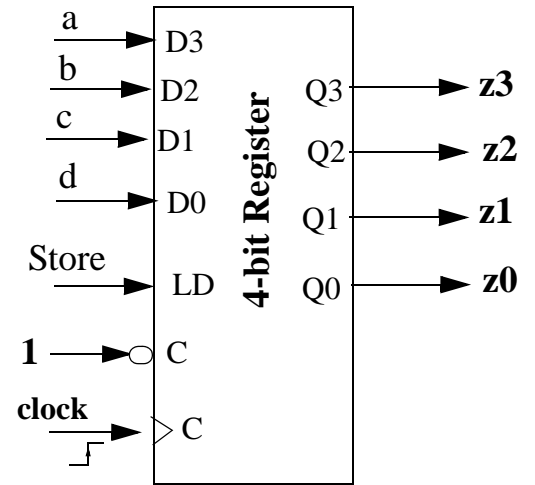
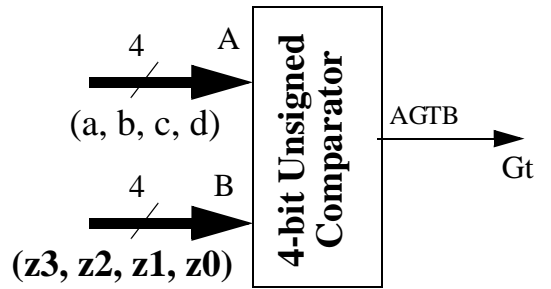
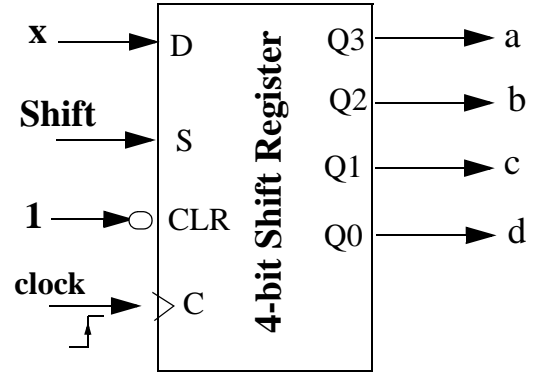
(40 pts)

2) Consider a **sequential** circuit with **two** inputs and **five** outputs. The black-box view and implementation of this sequential circuit with a 4-bit shift register studied in class, a 4-bit register and a 4-bit unsigned binary comparator are shown below :

You can complete the table on this sheet



T	Shift	x	a b c d	Gt	Store	z3 z2 z1 z0	Valid
t0	0	0	0 0 0 0	0	0	0 0 0 0	1
t1	1	0					
t2	1	1					
t3	1	0					
t4	1	1					
t5	0	0					
t6	1	1					
t7	1	0					
t8	1	0					
t9	1	1					
t10	0	0					
t11	1	1					
t12	1	1					
t13	1	1					
t14	1	0					
t15	0	0					
t16	1	1					



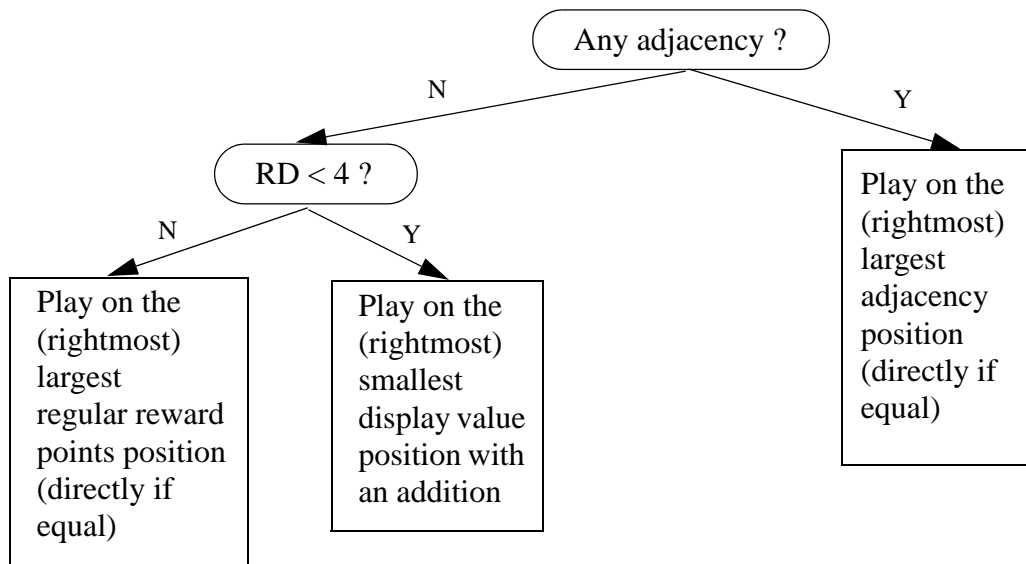
Write your name on this sheet

Determine what this sequential circuit does (the **purpose**) by continuing with the above table and showing the values for **17** clock periods.

If you **cannot** figure out the purpose, just write “I cannot determine the purpose.”

(25 pts)

3) Consider the **Ppm** term project. Assume that the playing strategy of the **machine** player is as follows :



Consider the following table that shows the random digit, displays **before** and **after** the **machine** player plays, whether the random digit is played directly or added, the number of adjacencies, the points earned by the **machine** player and whether the machine player plays again :

RD	Displays Before Play				Displays After Play				D/A	The Adjacency	Points Earned (Decimal)	Machine player plays again
	PD3	PD2	PD1	PD0	PD3	PD2	PD1	PD0				
2	E	6	E	6								
5	5	5	A	A								
8	7	7	7	7								
0	F	E	F	F								
4	6	A	B	A								

Assume that the code is **F8**.

A circle is drawn on a position if it is played on. The meaning of **D/A** is Direct/Add which is whether the player plays the random digit **directly** on a position or by **adding** to a position.

Note that the cases are **independent** of each other. That is, they do not necessarily follow each other with respect to time.

Complete the table.

You can complete the table on this sheet

Write your name on this sheet