King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Department of Computer Engineering

COE 308 – Computer Architecture (T032)

Homework # 05 (SOLUTION)

***** Show all your work. No credit will be given if work is not shown! *****

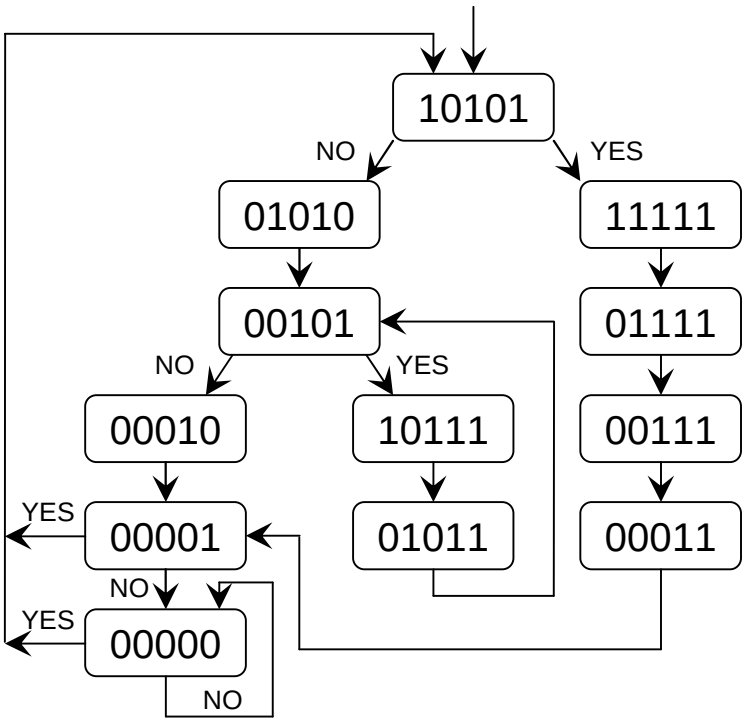
Problem # 1: Solve problem 5.14 from the textbook.

Solution:

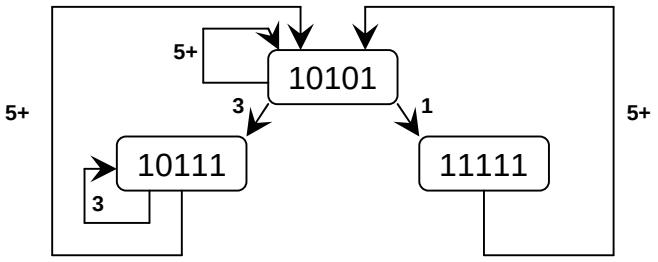
- To find ***Initial Collision Vector***, find the distances between every pair of X's in each row:

Stage	Distance
1	{}
2	2,4
3	2
4	{}

- Distance vector = (4, 2, 0) ⇒ ***Initial Collision Vector*** = 10101
- State diagram is as follows:



- Reduced/Simplified state diagram is as follows:



- Simple cycles:

State		Simplified Cycles	Average
10101		5,5,5,5,…	5
	OR	3,5,3,5,…	4
	OR	1,5,1,5,…	3
10111		3,3,3,3,…	3
	OR	5,3,5,3,…	4
11111		5,1,5,1,…	3

Thus, simple cycles are (5), (3,5), (1,5), (3)

- From previous step, the minimum greedy cycle average latency is 3. Also, from reservation table, maximum number of X's in a row = maximum(1,3,2,1) = 3. Furthermore, maximum number of 1's in ***Initial Collision Vector*** is 3.

$\Rightarrow 3 \leq$ Minimum Average Latency (MAL) $\leq 3 \leq 3$

Problem # 2: Solve problem 5.15 from the textbook.

Solution:

Original Reservation Table:

Stages \ Time	0	1	2	3	4	5	6
1	′	′		′			
2			′			′	
3				′		′	
4					′		′

Working table:

Stages \ Time	0	1	2	3	4	5	6	7	8
1	′	′		F	F	′	F	F	F
2			′			F		′	F
3				′			F	′	
4							′		′

Modified Reservation Table:

Stages \ Time	0	1	2	3	4	5	6	7	8
1	′	′		D	D	′			
2			′					′	
3				′				′	
4							′		′