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In [3]:   ### CSCI-3080 Discrete Structure
          ### OLA 6: Chapter 9 -- Finite-Sate Machine & Turing Machines
          ###          Chapter X -- Binary Encoding Scheme
          ### Name:
          ### Student ID:
          ### Date:
          ### Total: 100 Points
```

1. Please draw the state graph for the following finate state machine, and compute the output sequence for the given input sequence. (16 points)

(For the output, please **ignore the first bit for the inital state**.)

(a) (**8 points**)

Input:0011

0011

Present state	Next state		Output
	Present input		
	0	**1**	
S_0	S_2	S_3	0
S_1	S_0	S_1	1
S_2	S_1	S_3	0
S_3	S_1	S_2	1

(**Please draw the time table how to get the output**)

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In [ ]:
```

(b) (**8 points**)

Input:acbbca

$acbbca$

Present state	Next state			Output
	Present input			
	a	*b*	*c*	
S_0	S_1	S_1	S_1	0
S_1	S_2	S_2	S_1	0
S_2	S_0	S_2	S_1	1

(**Please draw the time table how to get the output**)

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In [ ]:
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2. Finite-State Machine (16 points)

(a) Please construct a finite-state machine that will compute the **bitwise OR** of two binary input string. (**8 points**)

(**Please draw the finite-state machine**)

In [ ]:

(b) Write the output for the input sequence consisting of the strings 11011 and 10010 (read left to right) (**8 points**)

(For the output, please **ignore the first bit for the initial state**.)
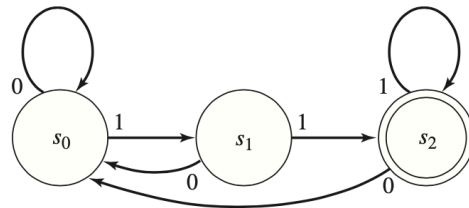
(**Please draw the time table how to get the output**)

In [ ]:

3. Determine whether the given machine recognizes the given input string. (**16 points**)
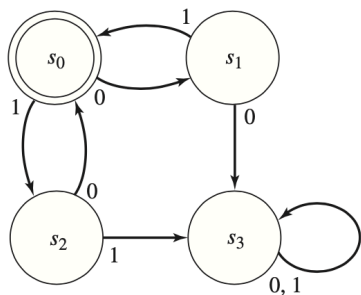
(a) (**8 points**)

Input:01110111

01110111

(**Please draw the time table how to get the output**)
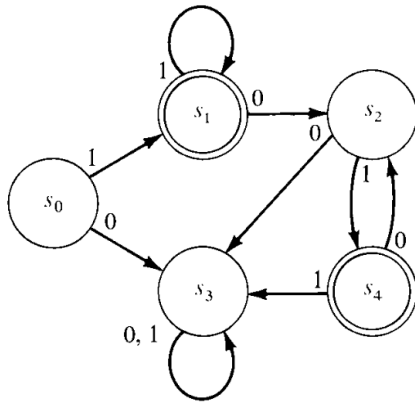
In [ ]:

(b) (**8 points**)

Input:01101

01101

(**Please draw the time table how to get the output**)
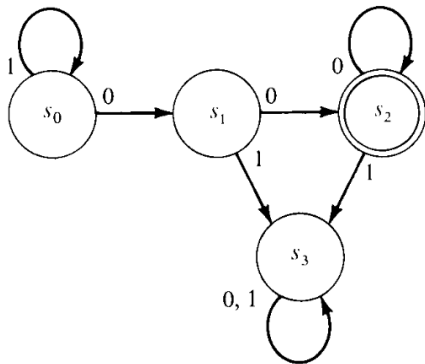
In [ ]:

4. Please give a regular expression for the set recognized by the following finite-state machine. (**10 points**)

(a) (**5 points**)

In [ ]:

(b) (**5 points**)

In [ ]:

5. Consider the Turing Machine (**10 points**)

(0, 1, 1, 0, R)
(0, 0, 0, 1, R)
(1, 1, 1, 1, R)
(1, b, 1, 2, L)
(2, 1, 1, 2, L)
(2, 0, 0, 2, L)
(2, b, 1, 0, R)

(a). What is its behavior when started on the tape (**5 points**)

⋯	b	1	0	1	0	b	⋯
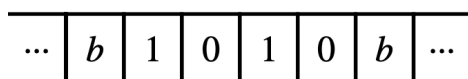
(**Please draw all the steps**)

In [ ]:

(b). What is its behavior when started on the tape (**5 points**)

...	b	1	0	1	b	...

(**Please show all the steps**)

In [ ]:

6. Please draw the relationship diagram for P, NP, NP–Complete and NP–Hard problems. (**5 points**)

In [ ]:

7. The following hamming code word was received. Use it to answer questions (1) – (5). (**27 points**)

0000110

(1) What position number is generated to determine if an error has ocurred in transmission? (**10 points**)

In [ ]:

(2)Did an error occur? (**2 points**)

In [ ]:

(3) What was the original correct coded message? (**5 points**)

In [ ]:

(4) What was the original correct message? (**5 points**)

In [ ]:

(5) If the message was binary, what was the decimal value of the correct message? (**5 points**)

In [ ]: