Assignment 7

Due on 2020-06-15, 23:59 BST.

1. (60 marks)
   (b) List all analyses that may be used to determine the time it takes for the system to compute the system's output. (6 marks)
   (c) Explain why the system can be implemented using a finite state machine. (6 marks)
   (d) Determine the minimum number of registers required to store the state variable in the system. (6 marks)
   (e) Explain how the system can be implemented using a counter. (6 marks)
   (f) Explain how the system can be implemented using a shift register. (6 marks)
   (g) Explain how the system can be implemented using a state machine. (6 marks)
   (h) Explain how the system can be implemented using a finite state machine. (6 marks)

2. For the digital system of Fig. 2, the minimum number of registers required to store the state variable in all the cycles is
   \[ n = 7, 8, 9, 10, 11 \]

3. (40 marks)
   (a) Explain why the system can be implemented using a finite state machine. (6 marks)
   (b) Determine the minimum number of registers required to store the state variable in the system. (6 marks)
   (c) Explain how the system can be implemented using a counter. (6 marks)
   (d) Explain how the system can be implemented using a shift register. (6 marks)
   (e) Explain how the system can be implemented using a state machine. (6 marks)
   (f) Explain how the system can be implemented using a finite state machine. (6 marks)

4. (40 marks)
   (a) Explain why the system can be implemented using a finite state machine. (6 marks)
   (b) Determine the minimum number of registers required to store the state variable in all the cycles. (6 marks)
   (c) Explain how the system can be implemented using a counter. (6 marks)
   (d) Explain how the system can be implemented using a shift register. (6 marks)
   (e) Explain how the system can be implemented using a state machine. (6 marks)
   (f) Explain how the system can be implemented using a finite state machine. (6 marks)

Table 1: Table for Problem 1.2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Input State</th>
<th>Output State</th>
</tr>
</thead>
<tbody>
<tr>
<td>x0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>x2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>x3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>x4</td>
<td>4</td>
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<td>7</td>
<td>7</td>
</tr>
<tr>
<td>x8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>x9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

5. (40 marks)
   (a) Explain why the system can be implemented using a finite state machine. (6 marks)
   (b) Determine the minimum number of registers required to store the state variable in all the cycles. (6 marks)
   (c) Explain how the system can be implemented using a counter. (6 marks)
   (d) Explain how the system can be implemented using a shift register. (6 marks)
   (e) Explain how the system can be implemented using a state machine. (6 marks)
   (f) Explain how the system can be implemented using a finite state machine. (6 marks)