Question 1
Explain the term Finite State Machine.

Question 2
a. Explain the operation of Mealy Machines.
   b. Explain the operation of Moore Machines.
   c. What is a sequence detector?

Question 3
a. Draw the state diagram of a sequence detector using Mealy Machine that detect the sequence 110 using non-overlapping case detection.
b. Draw the state diagram of a sequence detector using Mealy Machine that detect the sequence 101 using non-overlapping case detection.
c. Draw the state diagram of a sequence detector using Mealy Machine that detect the sequence 101 using overlapping case detection.

Question 4
a. Draw the state diagram of a sequence detector using Moore Machine that detect the sequence 110 using non-overlapping case detection.
b. Draw the state diagram of a sequence detector using Moore Machine that detect the sequence 101 using non-overlapping case detection.
c. Draw the state diagram of a sequence detector using Moore Machine that detect the sequence 101 using overlapping case detection.

Question 5
For the given state transition table, determine the JK flip-flop excitation and output Z equations. Assign the states S0=00, S1=01, S2=10 and, S3=11.

<table>
<thead>
<tr>
<th>Present AB</th>
<th>Present S</th>
<th>Next State X=0</th>
<th>Next State X=1</th>
<th>Output Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>S0</td>
<td>S1</td>
<td>S2</td>
<td>0</td>
</tr>
<tr>
<td>01</td>
<td>S1</td>
<td>S1</td>
<td>S2</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>S2</td>
<td>S2</td>
<td>S3</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>S3</td>
<td>S3</td>
<td>S0</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 6
For the given state diagram:-
a. Determine the type of machine.
b. Determine the sequence that is detected.
c. Determine the case of detection.
d. Draw the state table.
e. Using the state assignment S0=00, S1=01, S2=10 draw the state table with assignment.
f. Determine the number of flip-flops required.
g. Draw the excitation table using D flip-flops and determine the flip-flops excitation expressions.
h. Draw the logic circuit.
**Question 7**  
Design the logic circuit of a sequence detector that detects the sequence 1101 using Mealy model. Use JK flip-flops in your design and the detector uses non-overlapping case detection.

**Question 8**  
For the given state diagram:-  
  a. Determine the type of machine.  
  b. Determine the sequence that is detected.  
  c. Determine the case of detection.  
  d. Draw the state table.  
  e. Using the state assignment S0=00, S1=01, S2=10, S3=11 draw the state table with assignment.  
  f. Determine the number of flip-flops required.  
  g. Draw the excitation table using D flip-flops and determine the flip-flops excitation expressions.  
  h. Draw the logic circuit.

![State Diagram](image)

**Question 9**  
Design the logic circuit of a sequence detector that detects the sequence 1101 using Moore model. Use JK flip-flops in your design and the detector uses non-overlapping case detection.