

Name:

Grade: /20

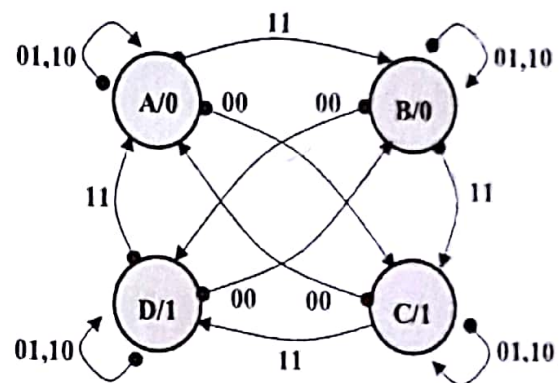
5) [20] Below is a Moore sequential circuit which monitors two inputs  $X_1X_2$ . When the two inputs  $X_1X_2$  are 00, the output  $Z$  toggles at every clock. When the two inputs  $X_1X_2$  are 11, the output  $Z$  toggles at every other clock. When the two inputs  $X_1X_2$  are different, the output  $Z$  holds its state and would not change until the inputs are equal again. The state diagram of the circuit is given to you.

5.a) [2] Fill in the next state table and the transition table using the indicated binary assignment below.

Present State	Next State				Output Z
	$X_1X_2 = 00$	01	11	10	
A	C	A	B	A	0
B	D	B	C	B	0
C	A	C	D	C	1
D	B	D	A	D	1

Q1 Q2	Q1+ Q2+				Output Z
	$X_1X_2 = 00$	01	11	10	
00	11	00	01	00	0
01	10	01	11	01	0
11	00	11	10	11	1
10	01	10	00	10	1



5.b) [2] Fill the next-state map for each of the two JK flip-flops below.

5.c) [2] Fill the JK input maps for each of the two flip-flops.

5.d) [2] Write the JK inputs and  $Z$  output expressions in a minimized form:

		X1X2					
		00	01	11	10		
Q1Q2	00						
	01						
	11						
	10						
		Q1+	J1	K1	Q2+	J2	K2

$$\begin{aligned}
 J_1 &= \overline{X_1} \overline{X_0} + Q_2 X_1 X_0 & K_1 &= \overline{X_1} \overline{X_0} + Q_2 X_1 X_0 \\
 J_2 &= \overline{X_1} \overline{X_0} + Q_2 X_1 X_0 & K_2 &= \overline{X_1} \overline{X_0} + Q_2 X_1 X_0 \\
 Z &= Q_1
 \end{aligned}$$