

OBJECTIVE QUESTIONS (30 POINTS)

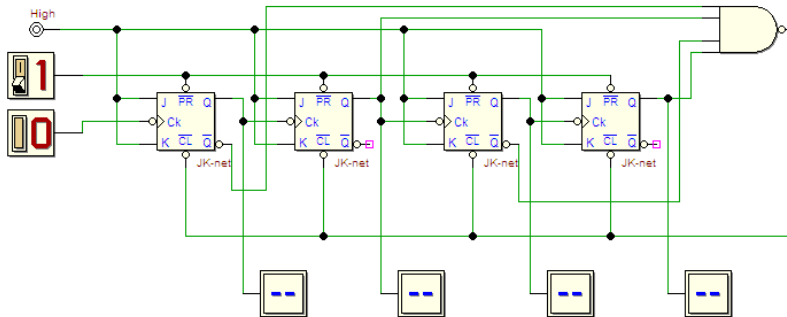
- | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | =A= | =B= | =C= | =D= | 11. | =A= | =B= | =C= | =D= |
| 2. | =A= | =B= | =C= | =D= | 12. | =A= | =B= | =C= | =D= |
| 3. | =A= | =B= | =C= | =D= | 13. | =A= | =B= | =C= | =D= |
| 4. | =A= | =B= | =C= | =D= | 14. | =A= | =B= | =C= | =D= |
| 5. | =A= | =B= | =C= | =D= | 15. | =A= | =B= | =C= | =D= |
| 6. | =A= | =B= | =C= | =D= | 16. | =A= | =B= | =C= | =D= |
| 7. | =A= | =B= | =C= | =D= | 17. | =A= | =B= | =C= | =D= |
| 8. | =A= | =B= | =C= | =D= | 18. | =A= | =B= | =C= | =D= |
| 9. | =A= | =B= | =C= | =D= | 19. | =A= | =B= | =C= | =D= |
| 10. | =A= | =B= | =C= | =D= | 20. | =A= | =B= | =C= | =D= |

STRUCTURE QUESTIONS (70 POINTS)

QUESTION 1 (13 POINTS)

QUESTION 2 (15 POINTS)

A.



B.

$$Q1 = \bar{Q}_1 \bar{X} + Q1$$

$$Q2 = \bar{Q}_1 \bar{X} + Q1 X$$

$$Z = X Q1$$

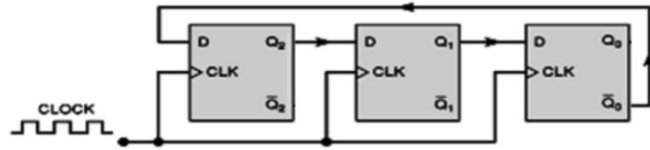
$$Q1 = Q1 = \bar{X} + Q1$$

$$Q2 \Rightarrow Q2 = \bar{Q}_1 \bar{X} + Q1 X$$

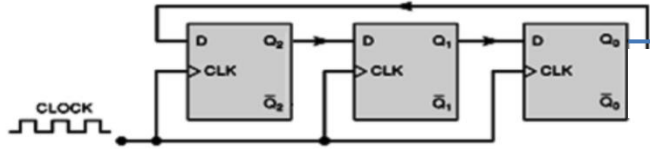
Input X	Present state		Next state		Z
	Q2	Q1	Q2+	Q1+	
0	0	0	1	1	0
0	0	1	0	1	0
0	1	0	1	1	0
0	1	1	0	1	0
1	0	0	1	0	0
1	0	1	0	0	0
1	1	0	0	1	1
1	1	1	0	1	1

QUESTION 3 (10 POINTS)

A.



3-bit Johnson Counter [3marks]



3-bit Ring Counter [3marks]

B.

Johnson Counter : $2 \times 3 = 6$ states [1mark]

Ring Counter: 3 states [1mark]

C. How to clear all output at once? [2]

$\overline{CLR} = 0$ [1mark]

$\overline{PRE} = 1$ [1mark]

QUESTION 4 (12 POINTS)

A.

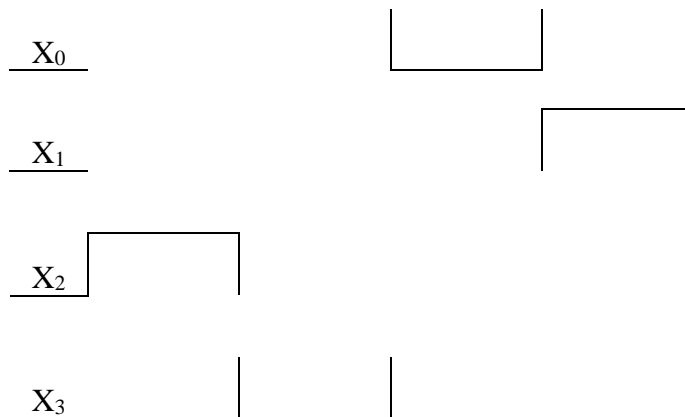
Truth Table: MUX (4 to 1)

C_1	C_0	A
0	0	X_0
0	1	X_1
1	0	X_2
1	1	X_3

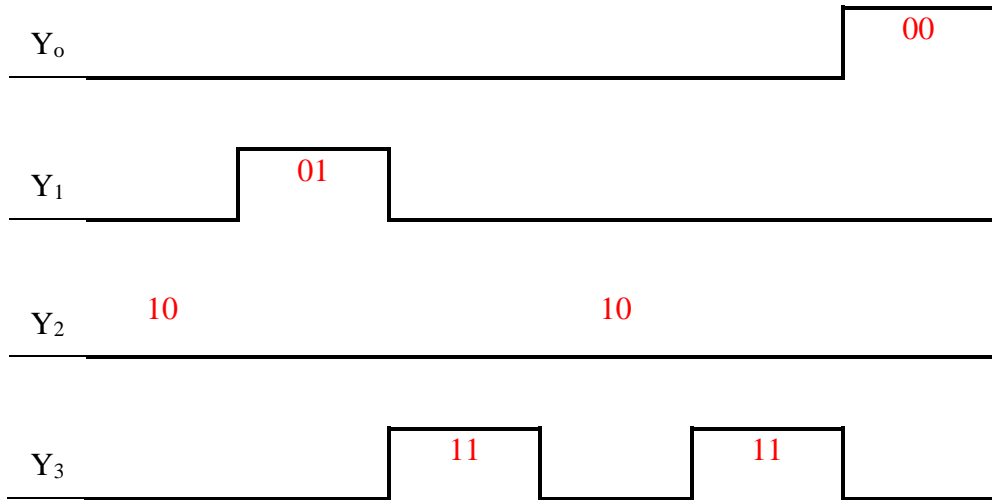
Compact Truth Table: DEMUX (1 to 4)

C_1	C_0	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	B
0	1	0	0	B	0
1	0	0	B	0	0
1	1	B	0	0	0

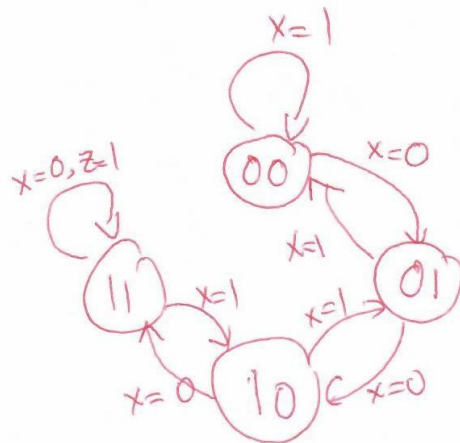
B.



C.



QUESTION 5 (20 POINTS)



Input X	Present State		Next State		JK FF Transition				Output
	Q_1	Q_0	Q_{1+}	Q_{0+}	J_1	K_1	J_0	K_0	Z
0	0	0	0	1	0	1	0	0	0
0	0	1	0	0	0	1	0	0	0
0	1	0	1	1	0	1	0	0	0
0	1	1	0	0	0	1	0	0	1
1	0	0	0	0	0	1	0	0	0
1	0	1	0	1	0	1	0	0	0
1	1	0	1	1	0	1	0	0	0
1	1	1	0	0	0	1	0	0	1