Abdul-Rehman, 19L-1135, CS-D1

B-1

Truth Table:

A_1	A_2	A_3	X_1	X_2	X_3	X_4	X_5	X_6	X_7
0	0	0	0	1	0	0	0	1	1
0	0	1	1	0	0	0	0	1	1
0	1	0	1	1	0	0	0	1	0
0	1	1	1	1	0	0	0	0	1
1	0	0	1	1	0	0	0	1	1
1	0	1	0	0	0	0	0	0	0
1	1	0	1	1	0	0	0	1	1
1	1	1	0	0	0	0	0	0	0

X_1, X_2, X_6 and X_7 Karnaugh maps

$$X_1 = \bar{A_1}A_3 + \bar{A_1}\cdot A_2 + A_1\bar{A_3}$$
$$X_2 = \bar{A_3} + \bar{A_1}\cdot A_2$$
$$X_6 = \bar{A_3} + \bar{A_1}\cdot \bar{A_2}$$
$$X_7 = \bar{A_1}\bar{A_2} + \bar{A_1}A_3 + A_1\bar{A_3}$$

$$X_1 = (\bar{A_1} \oplus A_3) + \bar{A_1}A_2$$
$$X_7 = (A_1 \oplus A_3) + \bar{A_1}\bar{A_2}$$

Abdul-Rehman, 19L-1135

Input equation for multiplexers:

○ For 4-1 mux #1:

$$Y_1 = X_1 = (A_1 \oplus A_3) + \bar{A}_1 A_2$$

○ For 2-1 mux #1:

$$Y_2 = X_2 = \bar{A}_3 + \bar{A}_1 \cdot A_2$$

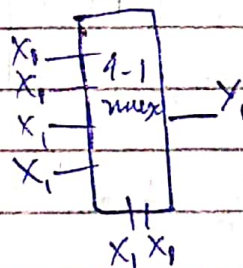○ For 2-1 mux #2:

$$Y_3 = X_6 = \bar{A}_3 + \bar{A}_1 \circ \bar{A}_2$$

○ For 4-1 mux #2:

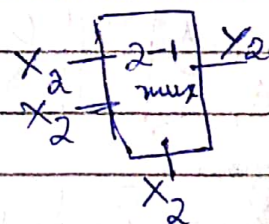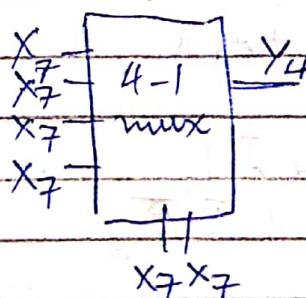$$Y_4 = X_7 = (A_1 \oplus A_3) + \bar{A}_1 \bar{A}_2$$

Mux diagram:
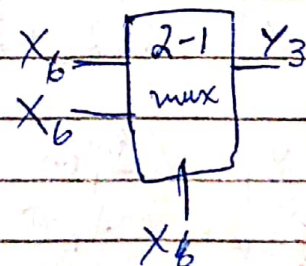
Abdul-Rehman; 191-1135, CS-D1

Q-2

Let the states be S_0, S_1, S_2, S_3.

State Diagram:
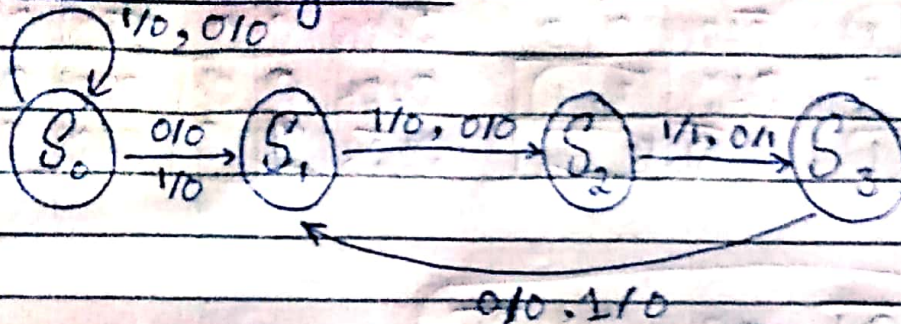
State table:

QA	QB	X	QA+	QB+	Z1	Z2
0	0	0	0	1	0	0
0	0	1	0	1	0	0
0	1	0	1	0	0	0
0	1	1	1	0	0	1
1	0	0	1	1	1	0
1	0	1	1	1	0	0
1	1	0	0	1	0	0
1	1	1	0	1	0	0

Abdul Rehman, 9L-1135

Kmap & Equations:

QA+   **QB+**   **Z1**   **Z2**

QAQB\X	$\bar{X}$	X
$\overline{QA}\,\overline{QB}$	0	0
$\overline{QA}\,QB$	1	1
$QA\,QB$	0	0
$QA\,\overline{QB}$	1	1

QAQB\X	$\bar{X}$	X
$\overline{QA}\,\overline{QB}$	1	1
$\overline{QA}\,QB$	0	0
$QA\,QB$	1	1
$QA\,\overline{QB}$	1	1

QAQB\X	$\bar{X}$	X
$\overline{QA}\,\overline{QB}$	0	0
$\overline{QA}\,QB$	0	0
$QA\,QB$	0	0
$QA\,\overline{QB}$	1	0

QAQB\X	$\bar{X}$	X
$\overline{QA}\,\overline{QB}$	0	0
$\overline{QA}\,QB$	0	1
$QA\,QB$	0	1
$QA\,\overline{QB}$	0	0

$$\boxed{QA+ = \overline{QA}\cdot QB + QA\,\overline{QB}}$$

$$\boxed{QB+ = QA + \overline{QB}}$$

$$Z_1 = QA\cdot\overline{QB}\cdot\bar{X}$$

$$Z_2 = \overline{QA}\cdot QB\cdot X$$