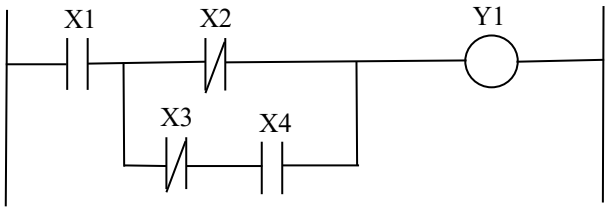
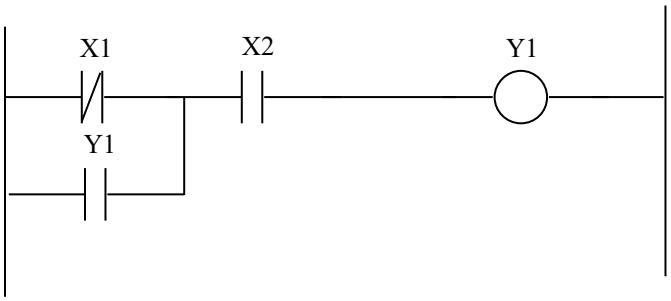
Solution to Practice Problem Set 4: PLC Programming Practice Problems

Question 1



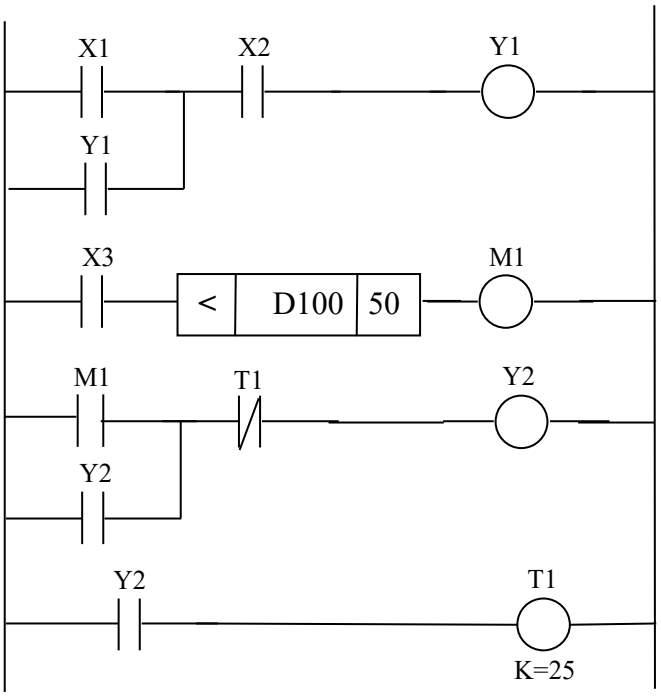
Signal	Description
X1	Sensor A
X2	Sensor B
X3	Sensor C
X4	Sensor D
Y1	Output connected to robot

Question 2



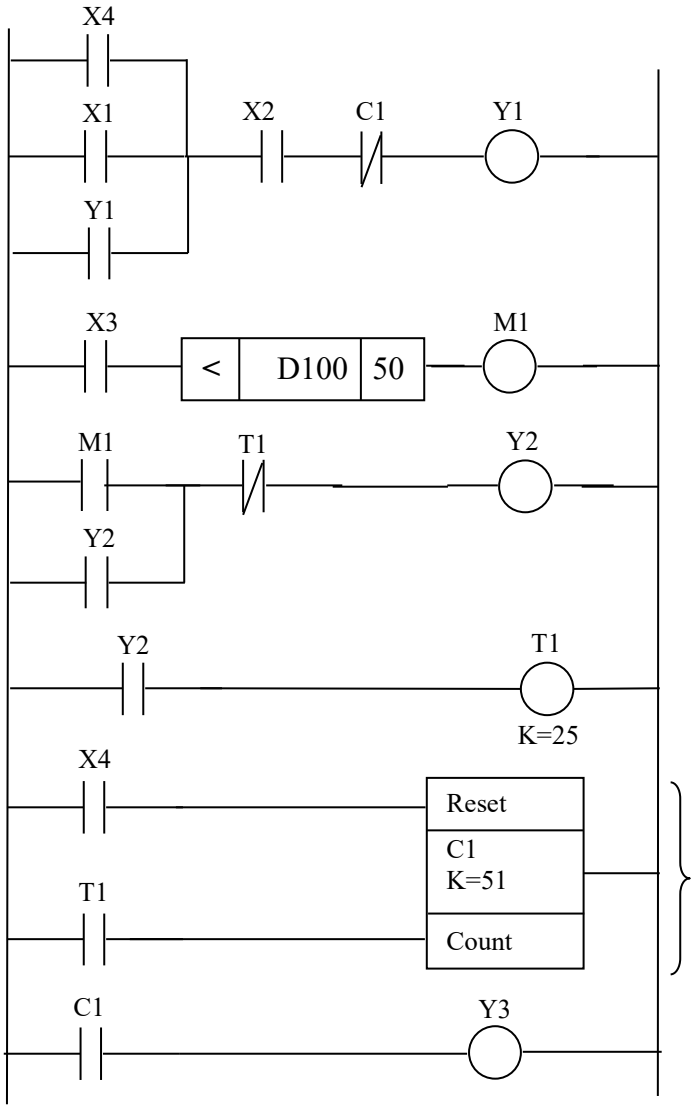
Signal	Description
X1	Normally Closed Start Switch
X2	Normally Closed Stop Switch
Y1	Conveyor Motor

Question 3



Signal	Description
X1	Start Switch (Normally Open)
X2	Stop Switch (Normally Closed)
X3	Proximity Sensor
D100	Weight in grams (from weight sensor)
Y1	Conveyor Motor
Y2	Solenoid for ejecting
M1	Marker for solenoid state
T1	0.25 s timer for solenoid

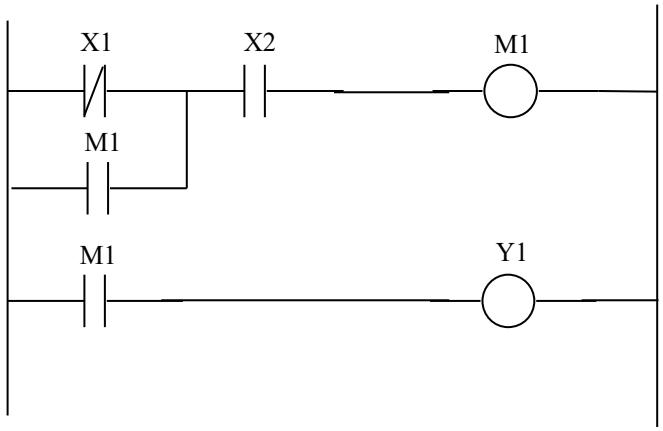
Question 4



Signal	Description
X1	Start Switch (Normally Open)
X2	Stop Switch (Normally Closed)
X3	Proximity Sensor
D100	Weight in grams (from weight sensor)
Y1	Conveyor Motor
Y2	Solenoid for ejecting
M1	Marker for solenoid state
T1	0.25 s timer for solenoid
C1	Counter for 51 ejected underweight parts
Y3	Warning light
X4	Restart switch

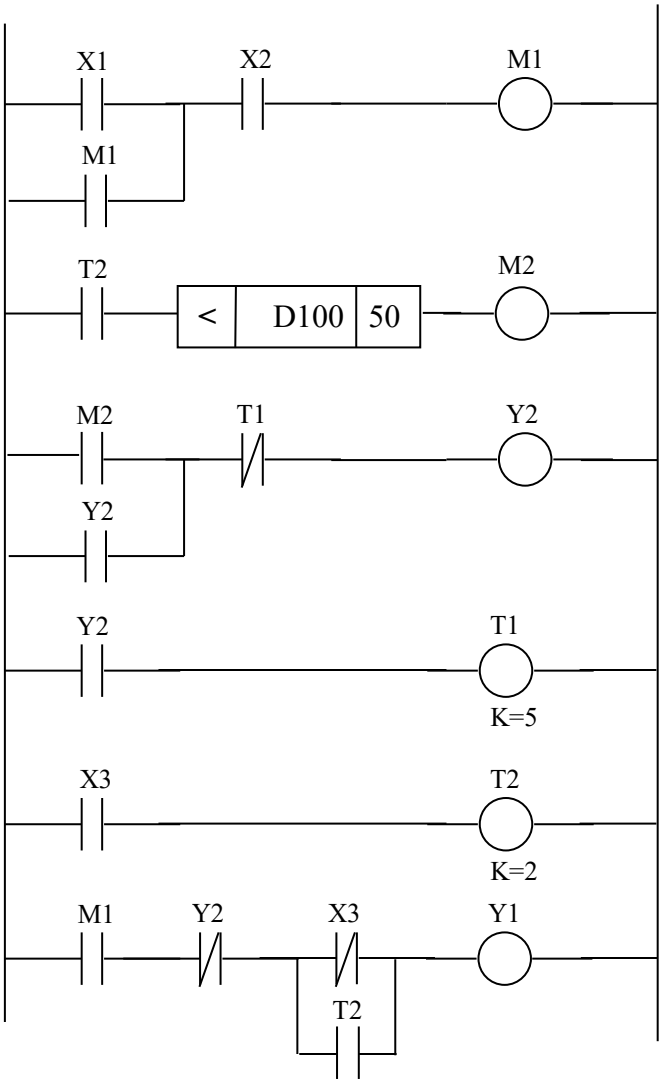
- K = 51 > 50
- Count using T1 rather than Y2 to ensure proper part ejection.

Question 5



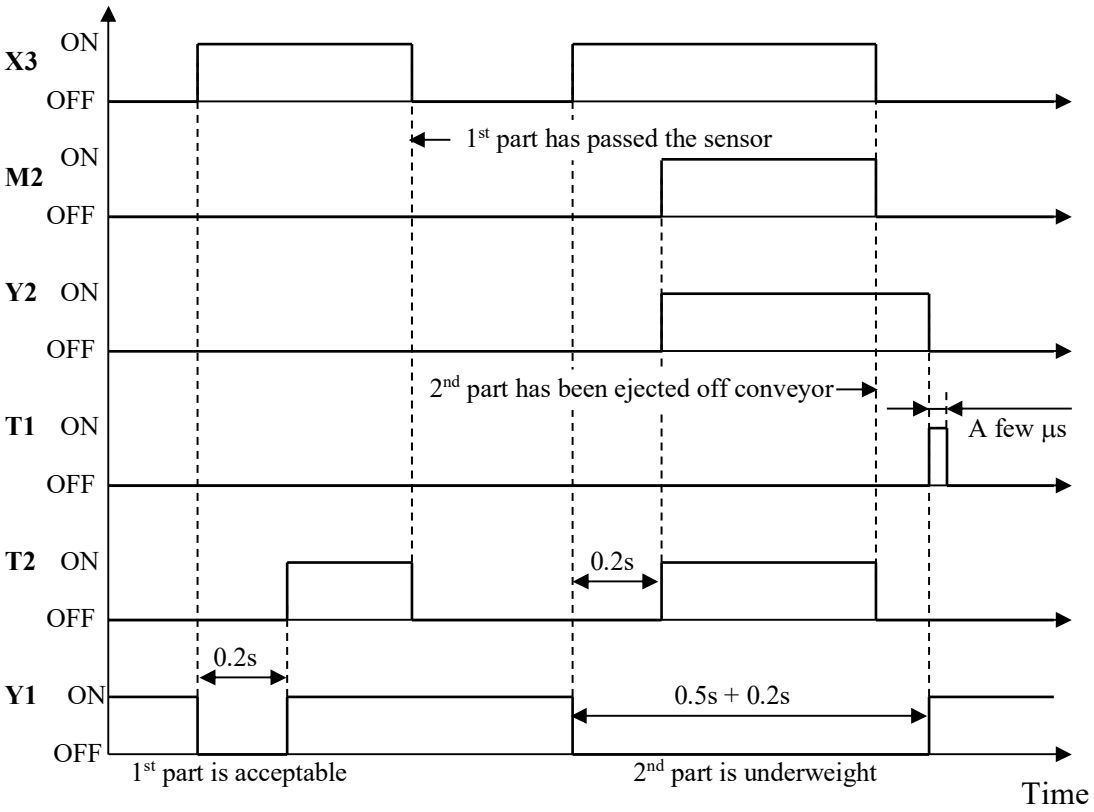
Signal	Description
X1	Normally Closed Start Switch
X2	Normally Closed Stop Switch
Y1	Conveyor Motor
M1	Marker for motor state

Question 6



Signal	Description
X1	Start Switch (Normally open)
X2	Stop Switch (Normally Closed)
X3	Proximity Sensor
M1	Marker for machine state
M2	Marker for ejecting
D100	Weight in grams (from weight sensor)
Y1	Conveyor Motor
Y2	Solenoid for ejecting
T1	Solenoid Timer (0.5 sec)
T2	Conveyor Timer (0.2 sec)

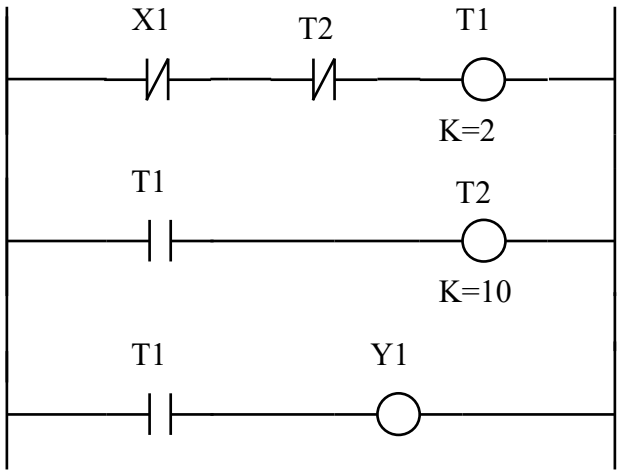
To provide further explanation of this program an approximate timing diagram is given on the next page. The timing is approximate since we do not know the speed of the conveyor or the spacing between parts.



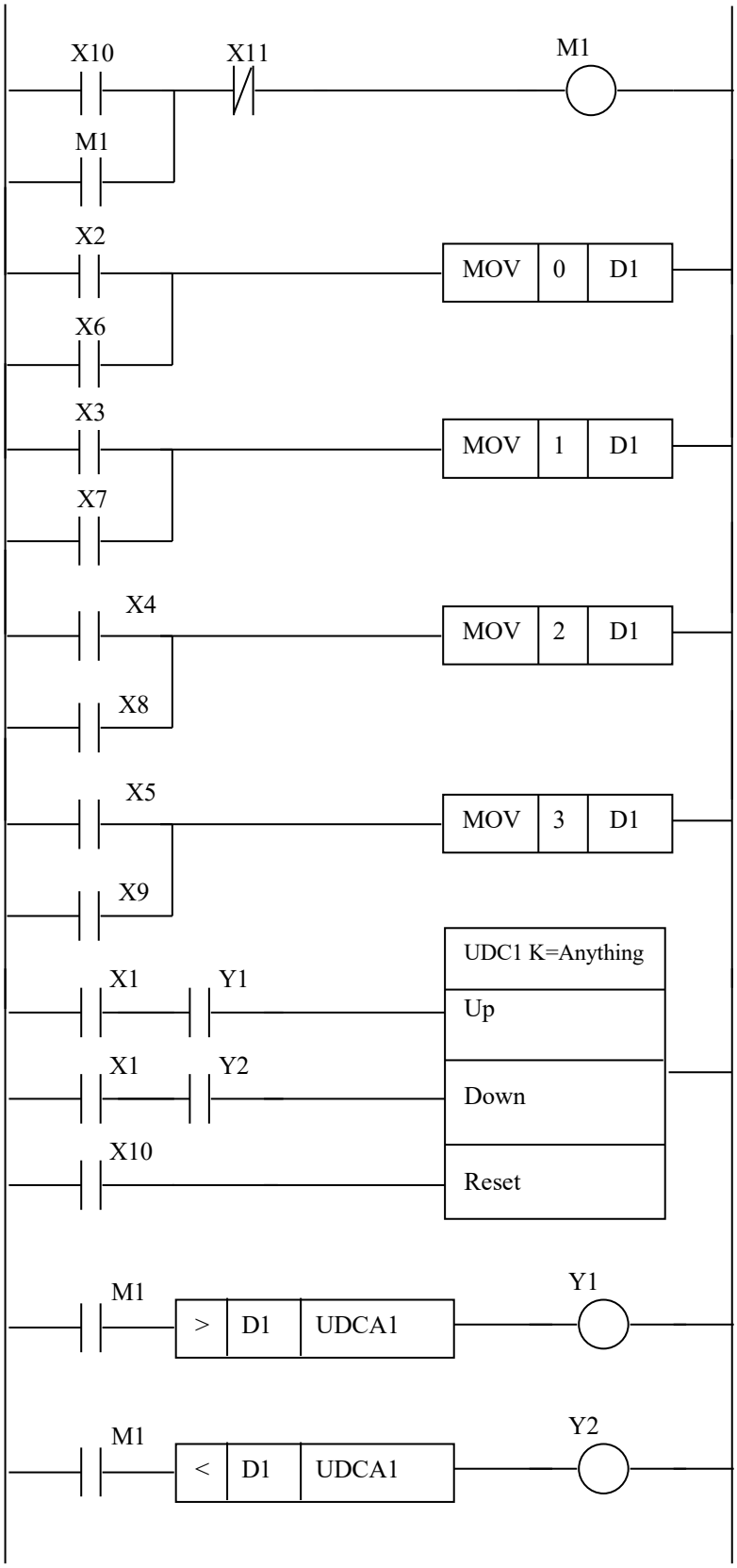
Approximate Timing Diagram for Question 6

Question 7

Signal	Description
X1	Proximity sensor
Y1	Motor
T1	Timer for 2 s OFF period
T2	Timer for 10 s ON period

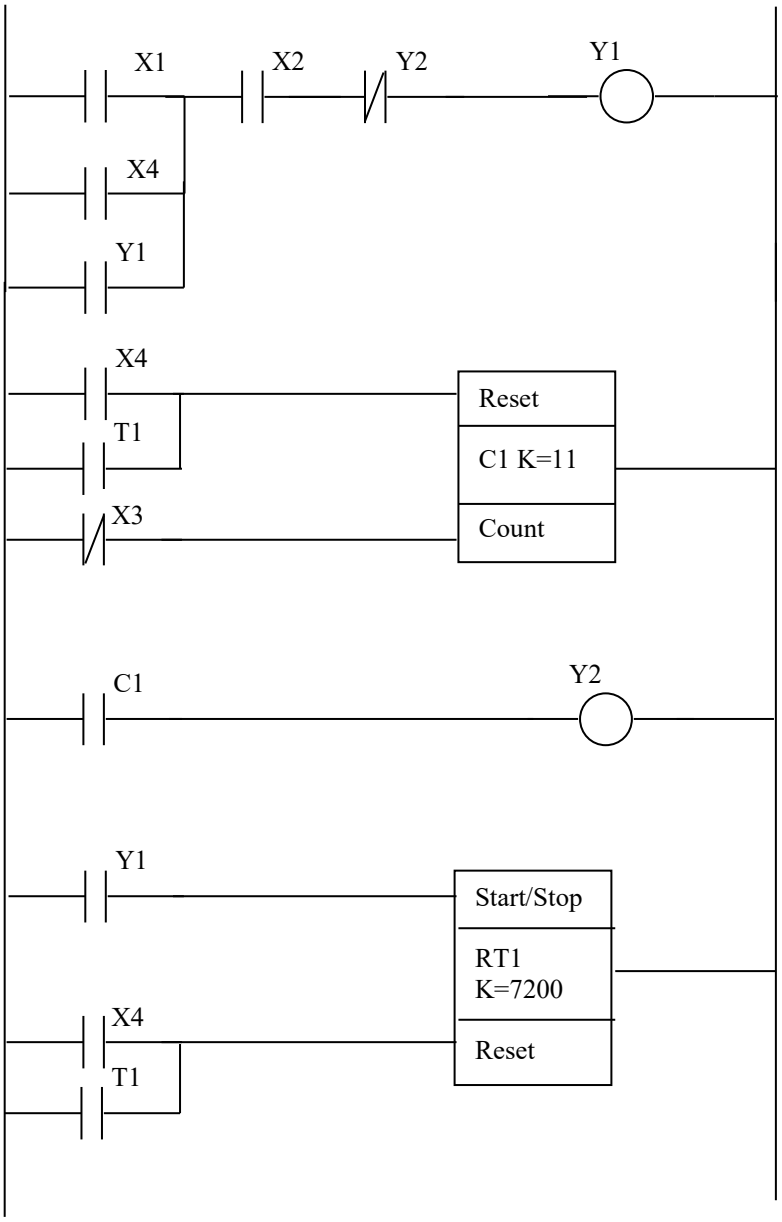


Question 8:



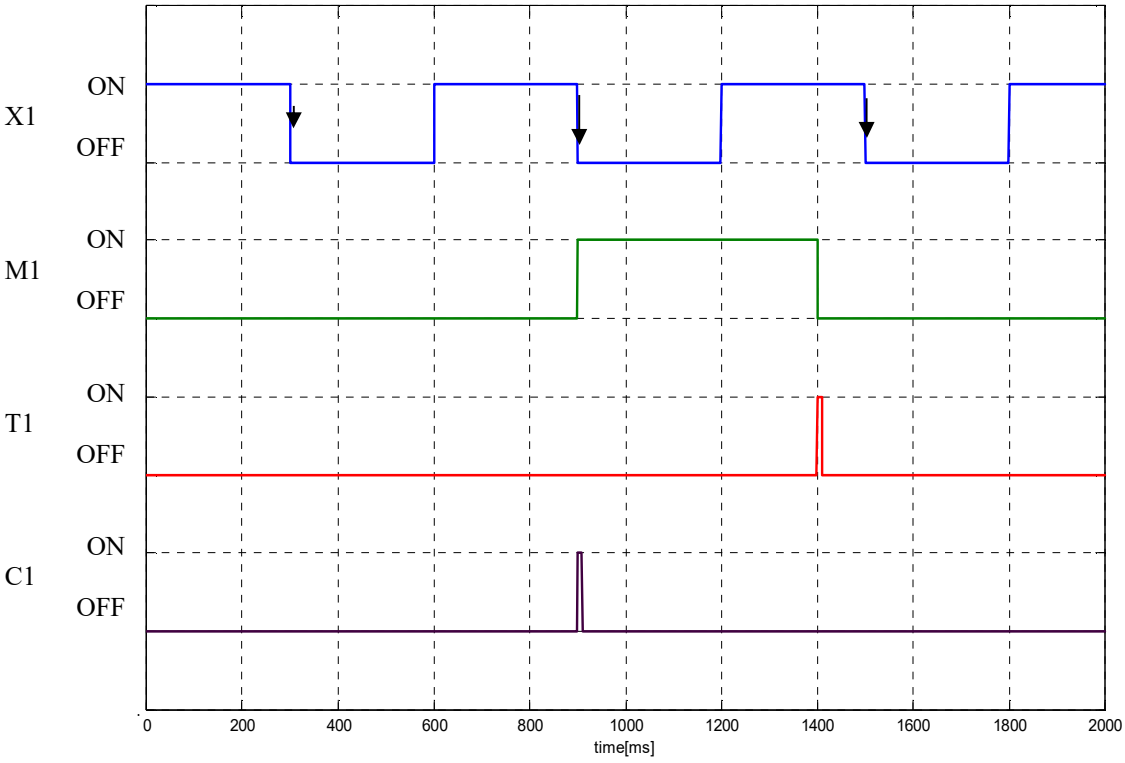
Signal	Description
X1	Proximity sensor
X2	1st floor call
X3	2nd floor call
X4	3rd floor call
X5	4th floor call
X6	Button #1 inside
X7	Button #2 inside
X8	Button #3 inside
X9	Button #4 inside
X10	Start button
X11	Stop button
UDC1	Up/down counter
Y1	Up motor
Y2	Down motor
D1	Number of desired floor
UDCA1	Number of current floor

Question 9:



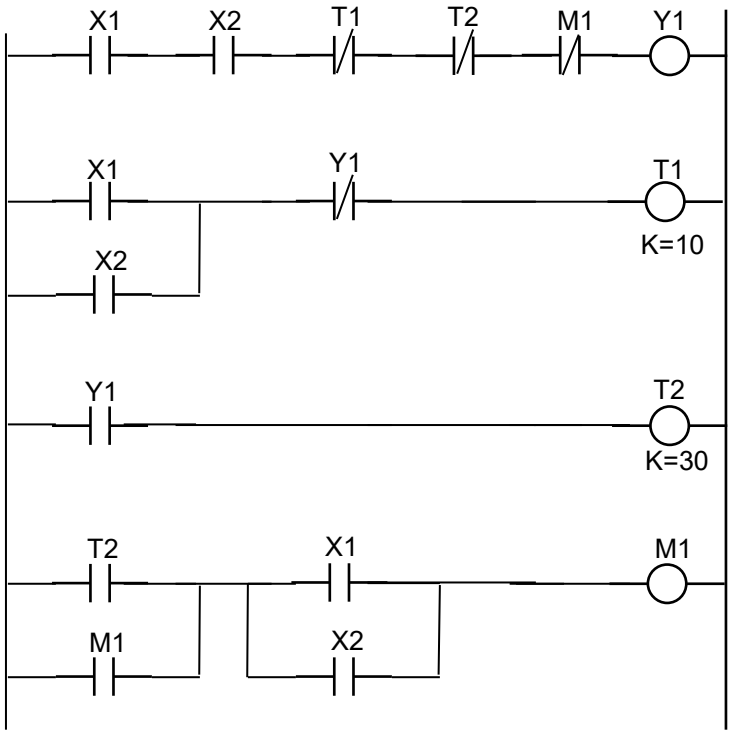
Signal	Description
X1	Normally open start switch
X2	Normally closed stop switch
X3	Signal from vision system.
X4	Restart button
RT1	Two hour timer
C1	11 part counter
Y1	Conveyer motor
Y2	Warning light

Question 10:


X1
ON
OFF
M1
ON
OFF
T1
ON
OFF
C1
ON
OFF
0
200
400
600
800
1000
1200
1400
1600
1800
2000
time[ms]

Question 11

Signal	Description
X1	First normally open pushbutton switch
X2	Second normally open pushbutton switch
T1	1 second timer for judging if the buttons are pressed together.
M1	Marker indicating whether the machine has finished a cycle
T2	Timer for keeping actuator running 3 seconds
Y1	Actuator



This rung controls the starting and stopping of the actuator.

If either button is held down over 1 second while the actuator is OFF then T1 is turned ON.

The actuator will run for 3 seconds, T2 will turn ON and the first rung will turn OFF the actuator.

When a cycle is done, if the user still has either button pressed then M1 will be turned ON. M1 then stays ON until both buttons are released. The "test for M1 OFF" instruction in the first rung will then prevent the machine from restarting incorrectly.