SVNIT, SURAT
M. TECH. I & C (ELECTRICAL DEPARTMENT)

IA LAB: Ladder Logic Programmes

Student name: *Darsh Gajjar*

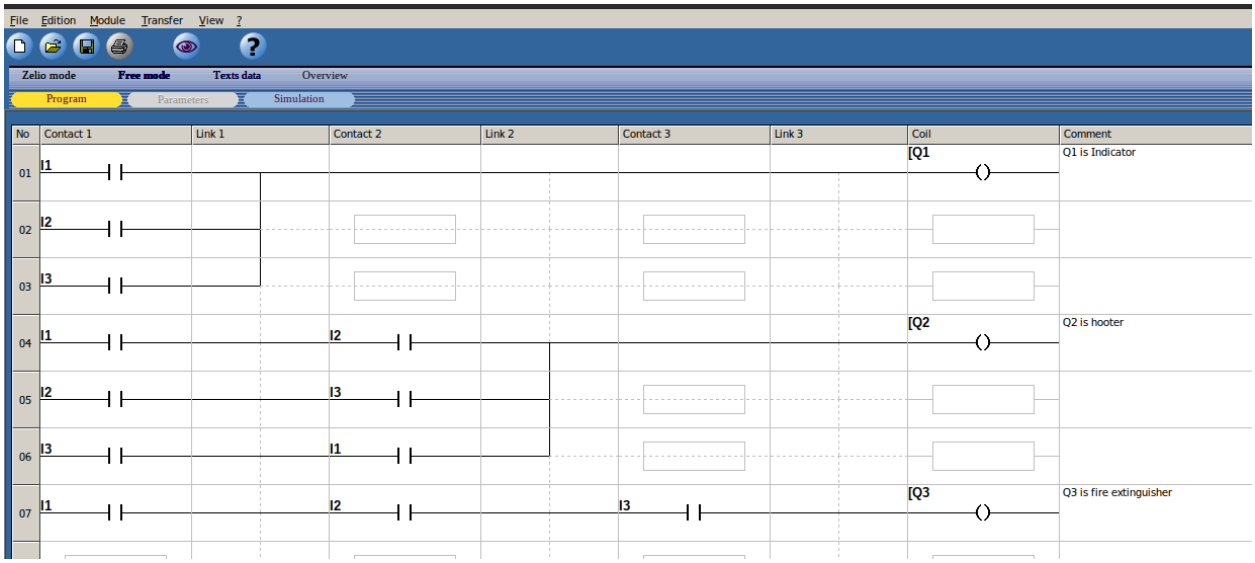
Course: *Industrial Automation LAB* – Professor: *Dr. H. G. Patel*
Due date: *04/01/2021*

Program #1

There is Big godown in which there are 3 sensors installed,

- If any one sensor is on then indicators ON,
- If any two sensors on then hooters ON,
- If all sensors are ON then Fire extinguisher should be ON

Answer.

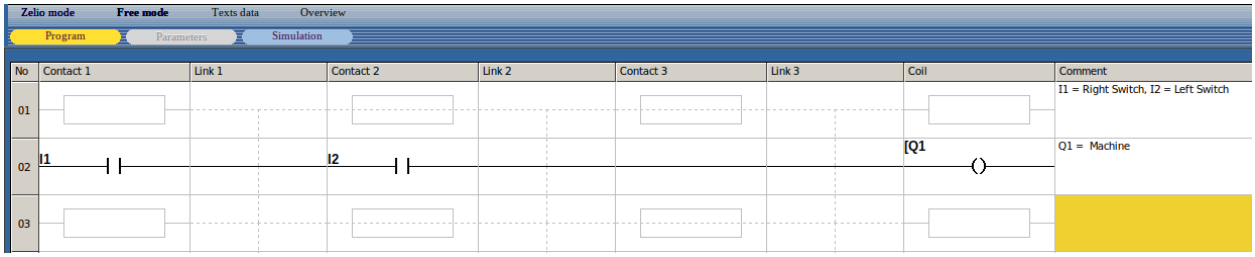


Program #2

One cutting machine with left and right start switches

- If both switches on then machine on
- When you release any switch machine off

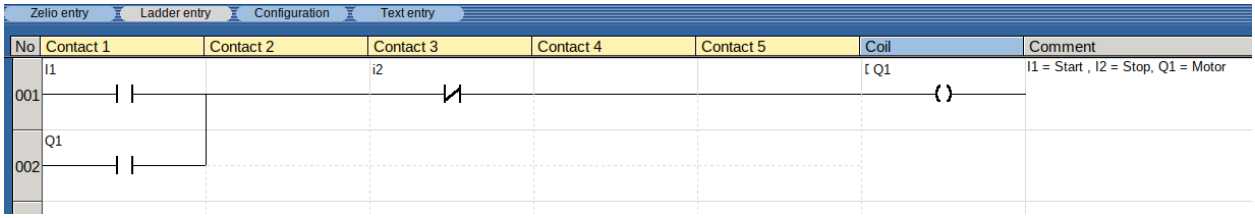
Answer.



Program #3

whenever we press ON Push button then Motor should remain ON and when STOP push button is press it shoulf OFF immediately

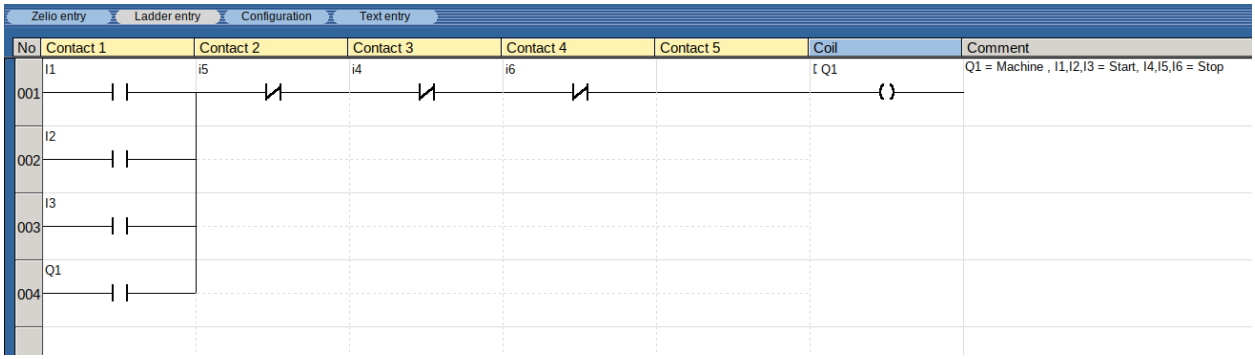
Answer.



Program #4

In 35 feet long machine design ladder logic by which operator should able to Start and Stop from three different place

Answer.

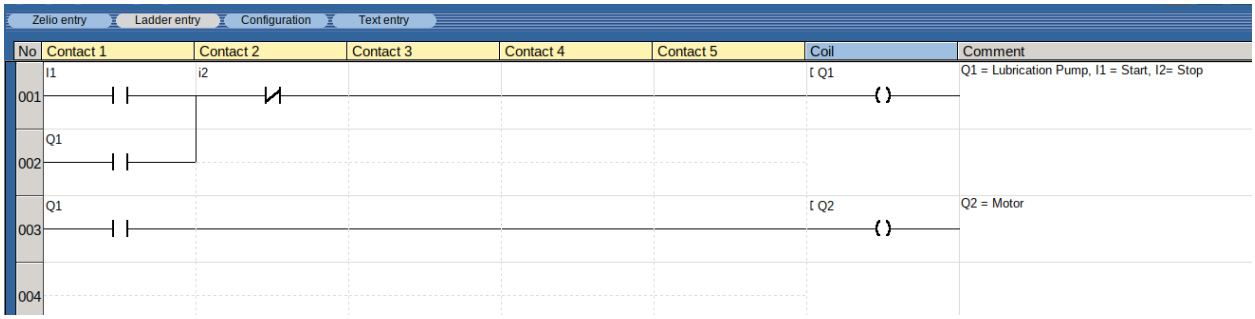


Program #5

There is one lubrication Pump and one Motor

- first lubrication Pump should be On and then Motor ON
- When STOP Push button is pressed Motor and Pump should be Stop together

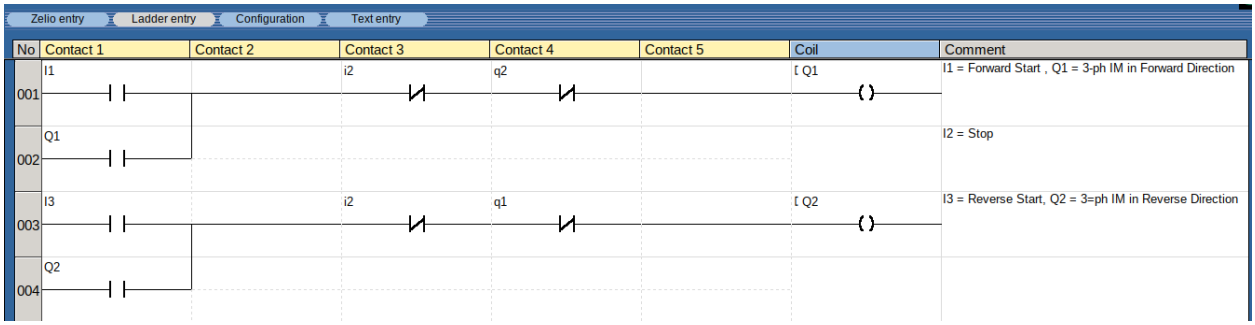
Answer.



Program #6

One 3-phase Induction Motor need to operate in forward/reverse direction when motor start operate in forward direction reverse direction should off first and when operate in reverse direction then forward direction should off first

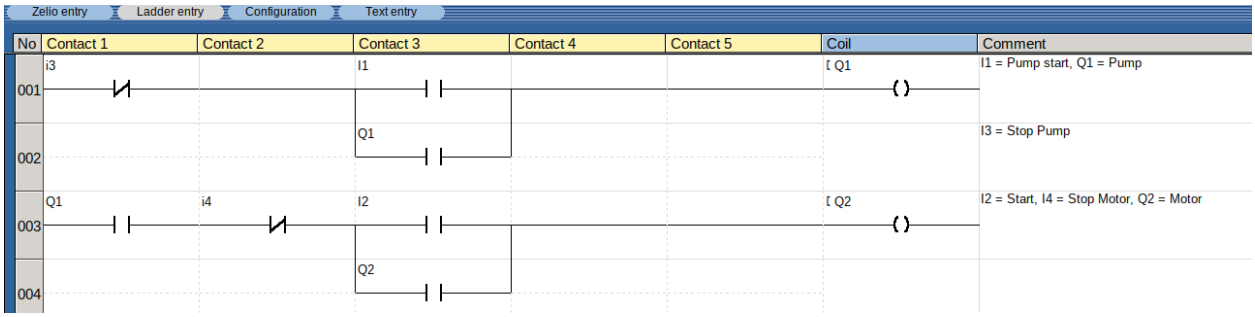
Answer.



Program #7

There is one motor and one pump,when start push buttion is pressed first pump and afterward motor should start and STOP button is individual.

Answer.

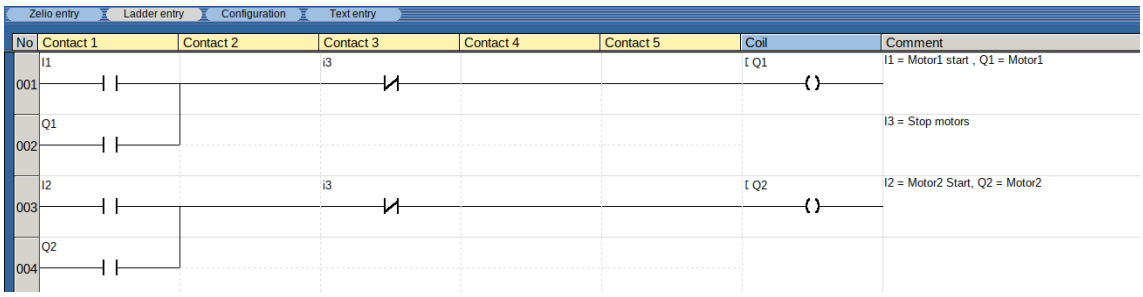


Program #8

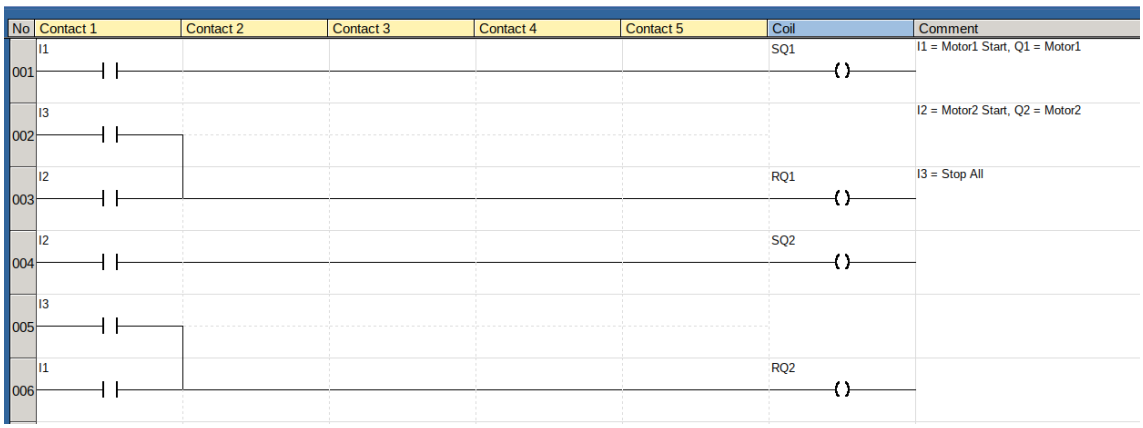
There are two Motors, in which one should work at one time and other remains in standby

1. with Stop Push button
2. with Set/reset coils
3. without any STOP push button

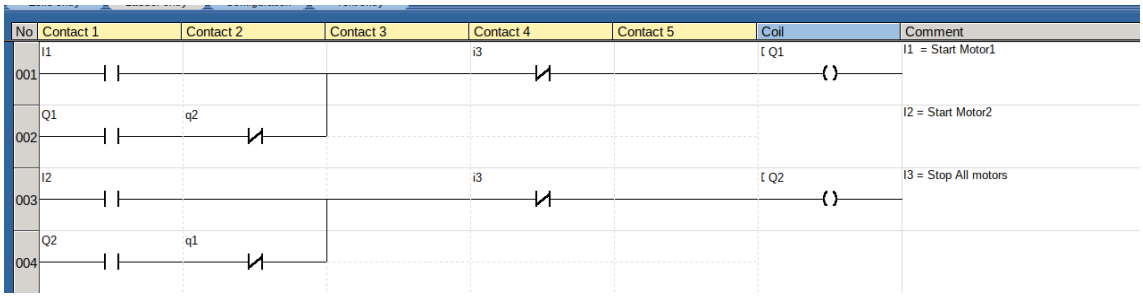
Answer.

1. 

2.



3.

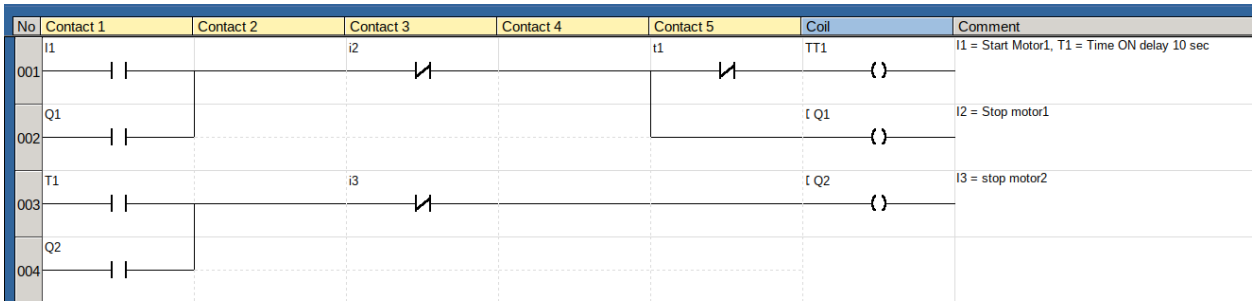


Program #09

There are two motors

- start motor1, after 10 second motor2 start automatically
- when motor1 stops second one stops automatically

Answer.

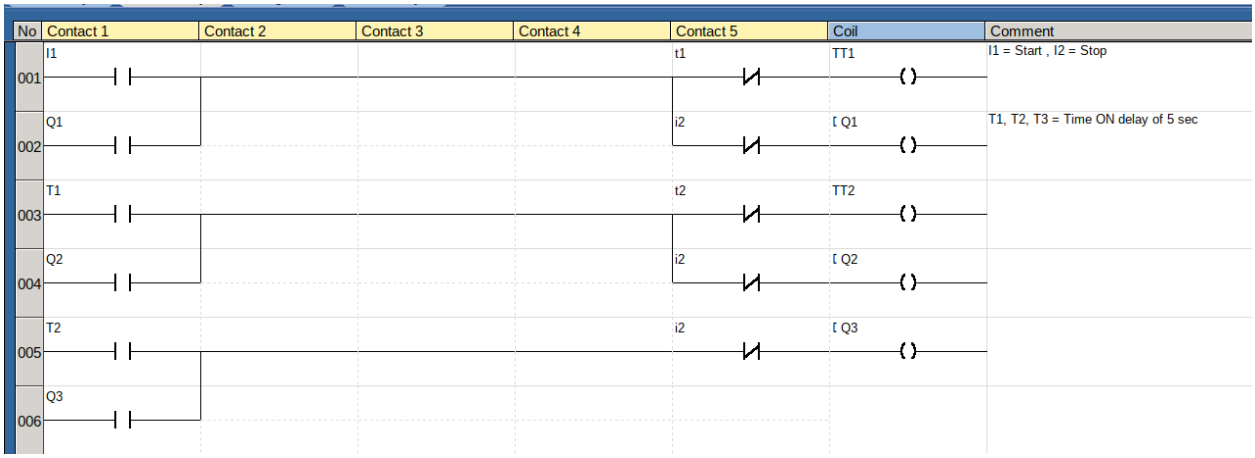


Program #10

There are three motors

- when start push button is pressed Motor1 ON
- after 5 sec Motor2 ON
- after 5 sec Motor3 ON
- when STOP push button is pressed all should STOP together

Answer.

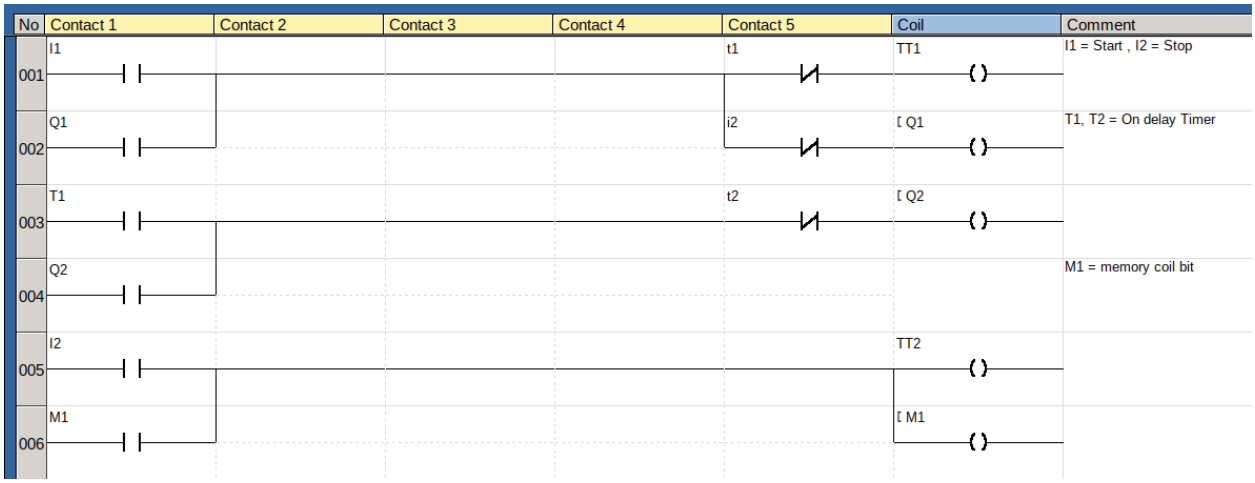


Program #11

There are two motors

- when start push button is pressed Motor1 ON and then after 5 second Motor2 ON
- when stop push button is pressed Motor1 off and then after 5 second Motor2 Off

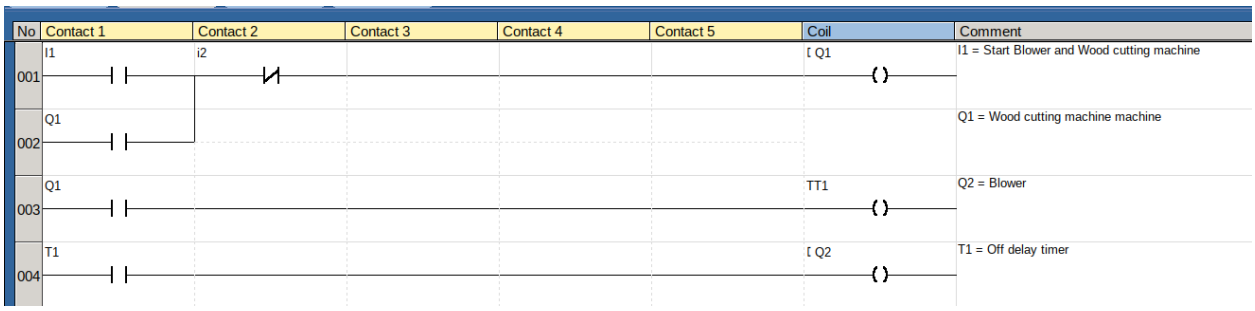
Answer.



Program #12

Consider one wood cutting machine and one blower as soon as wood cutting machine starts, blower should start, when wood cutting machine stops, blower stop after 10 second

Answer.



Program #13

There are two motors

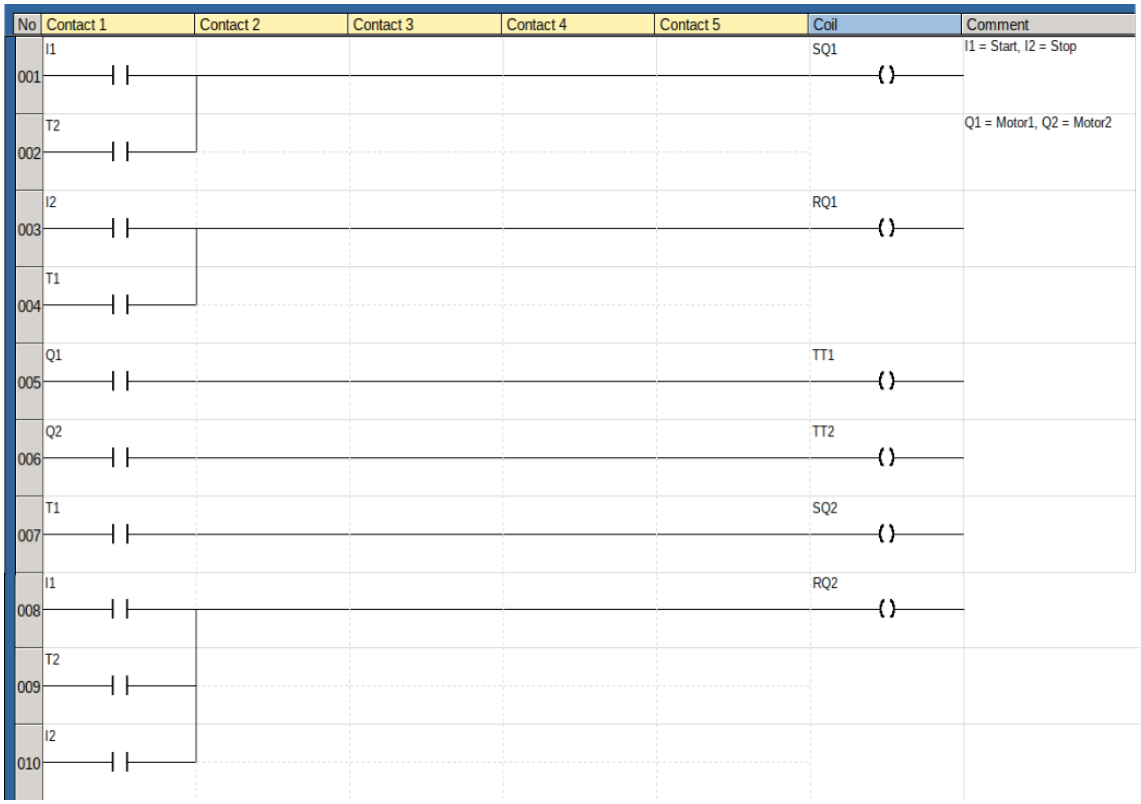
- Motor1 start immediately after Push button is pressed
- After 5 second Motor2 start and Motor1 Stop
- After 5 second Motor1 Start and Motor2 Stop

operate motors alternate mode continuosly

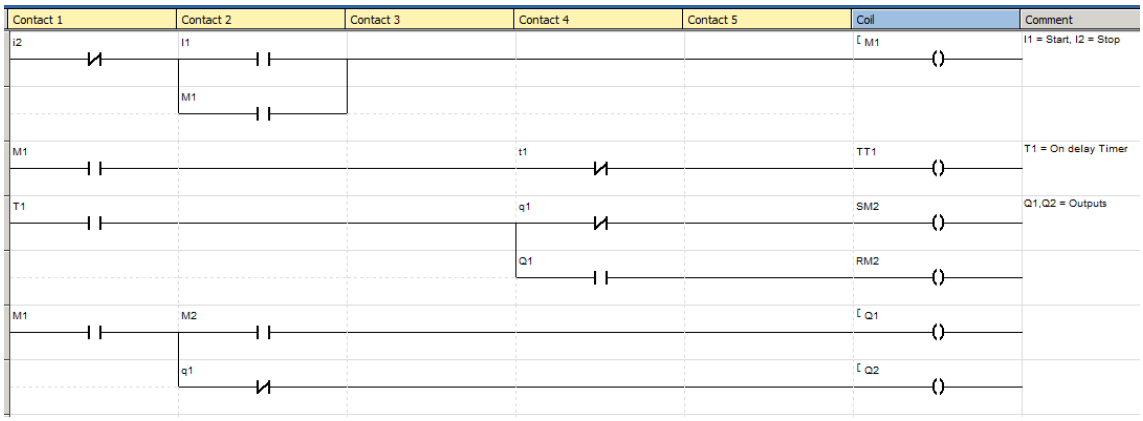
1. Do above logic using set/reset coil bit and two timers
2. Do above logic using set/reset coil bit and one timer
3. Do above logic using without set/reset and two timers
4. Do above logic using without set/reset and One timer

Answer.

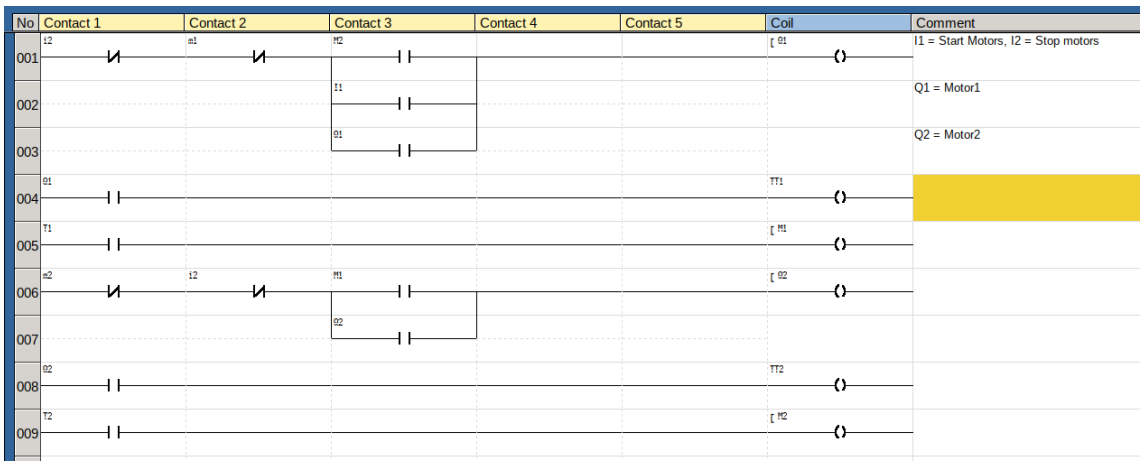
1. using set/reset and two timer



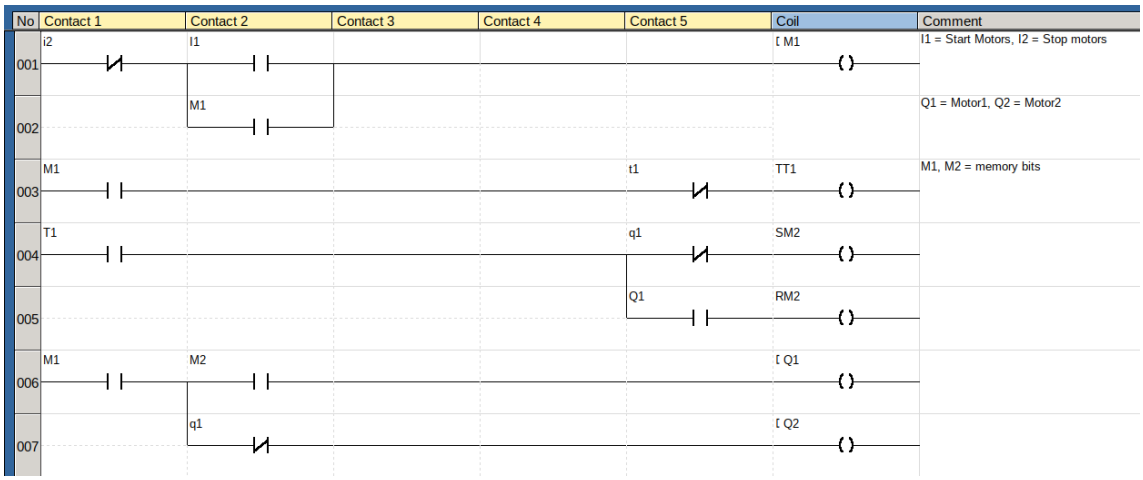
2. using set/reset and one timer



3. without set/reset and two timers



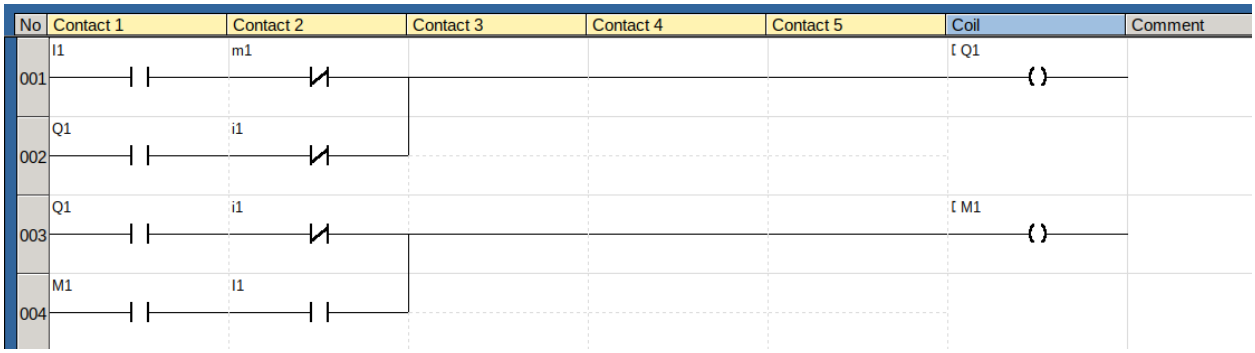
4. without set/reset and one timer



Program #14

One motor is operate using single push button and then when button pressed first motor should be ON and when pressed same button again it should OFF, then again if button pressed it should start again.

Answer.



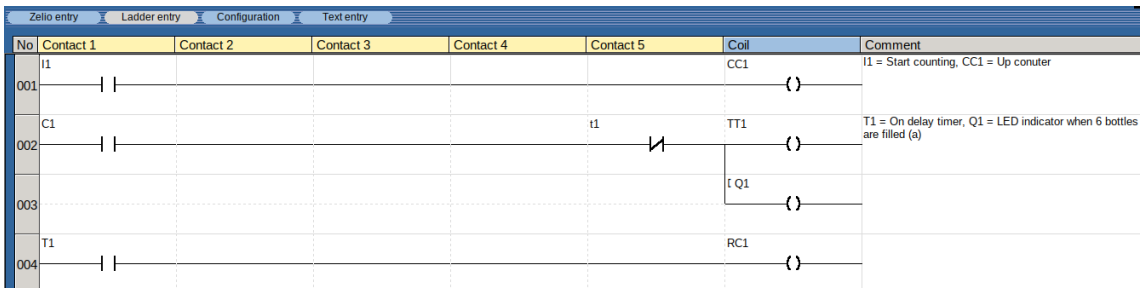
Program #15

In One bottle filling plant,there are 6 bottles in each box

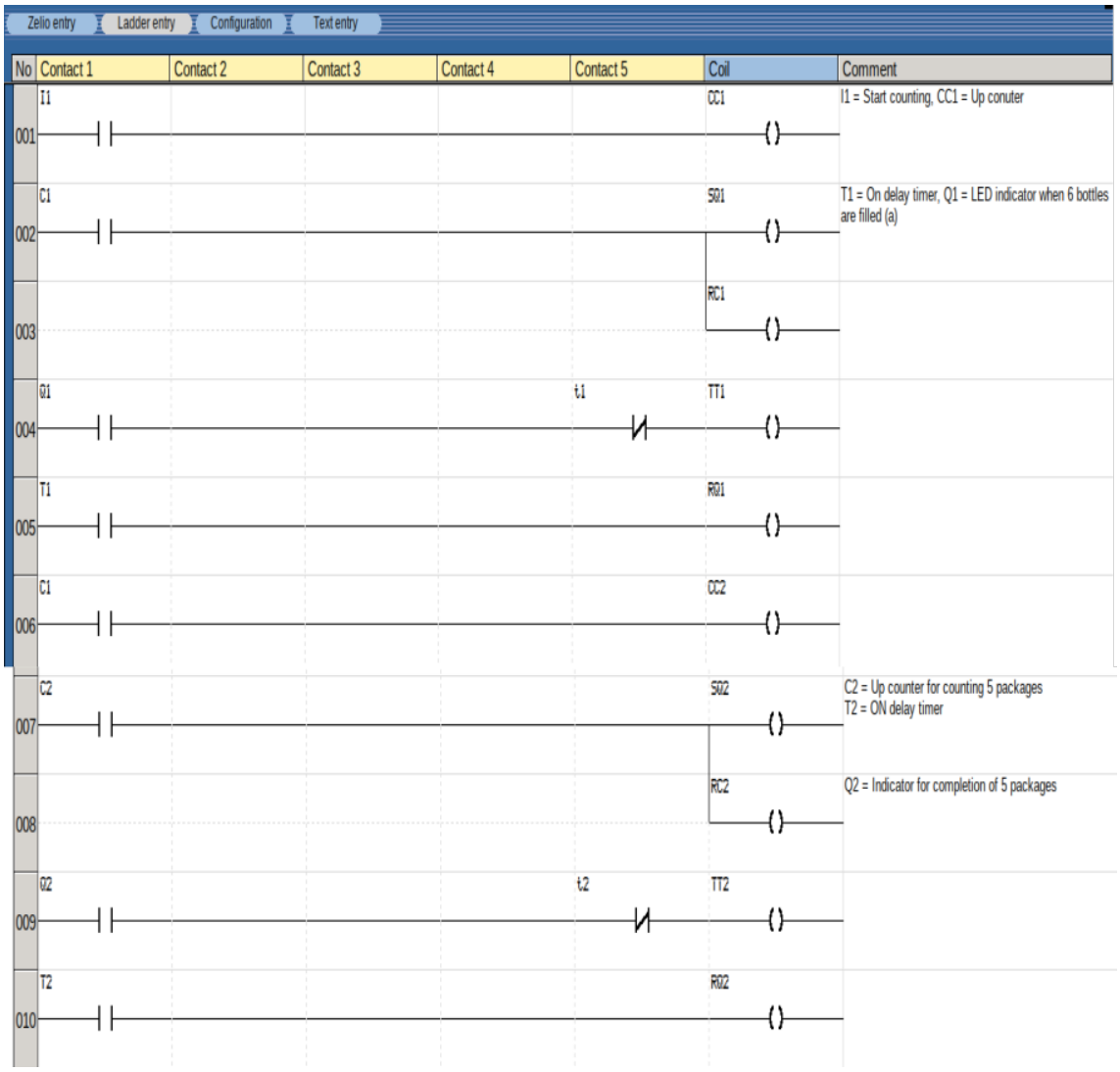
1. when six bottles are filled 1st indicator should be ON
2. when 5 such box are packed 2nd indicator should be ON

Answer.

1. answer of 1st part



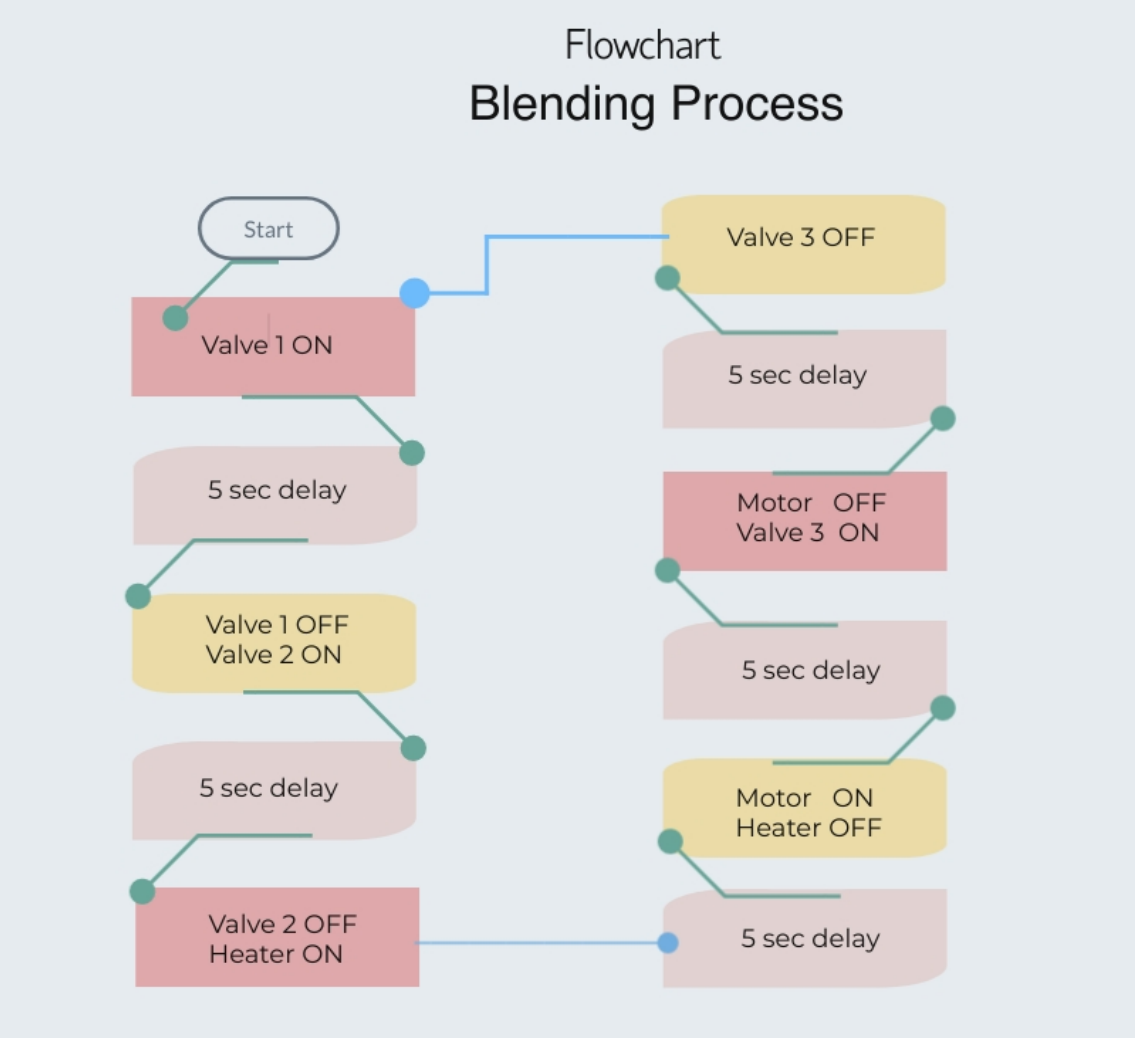
2. answer of 2nd part



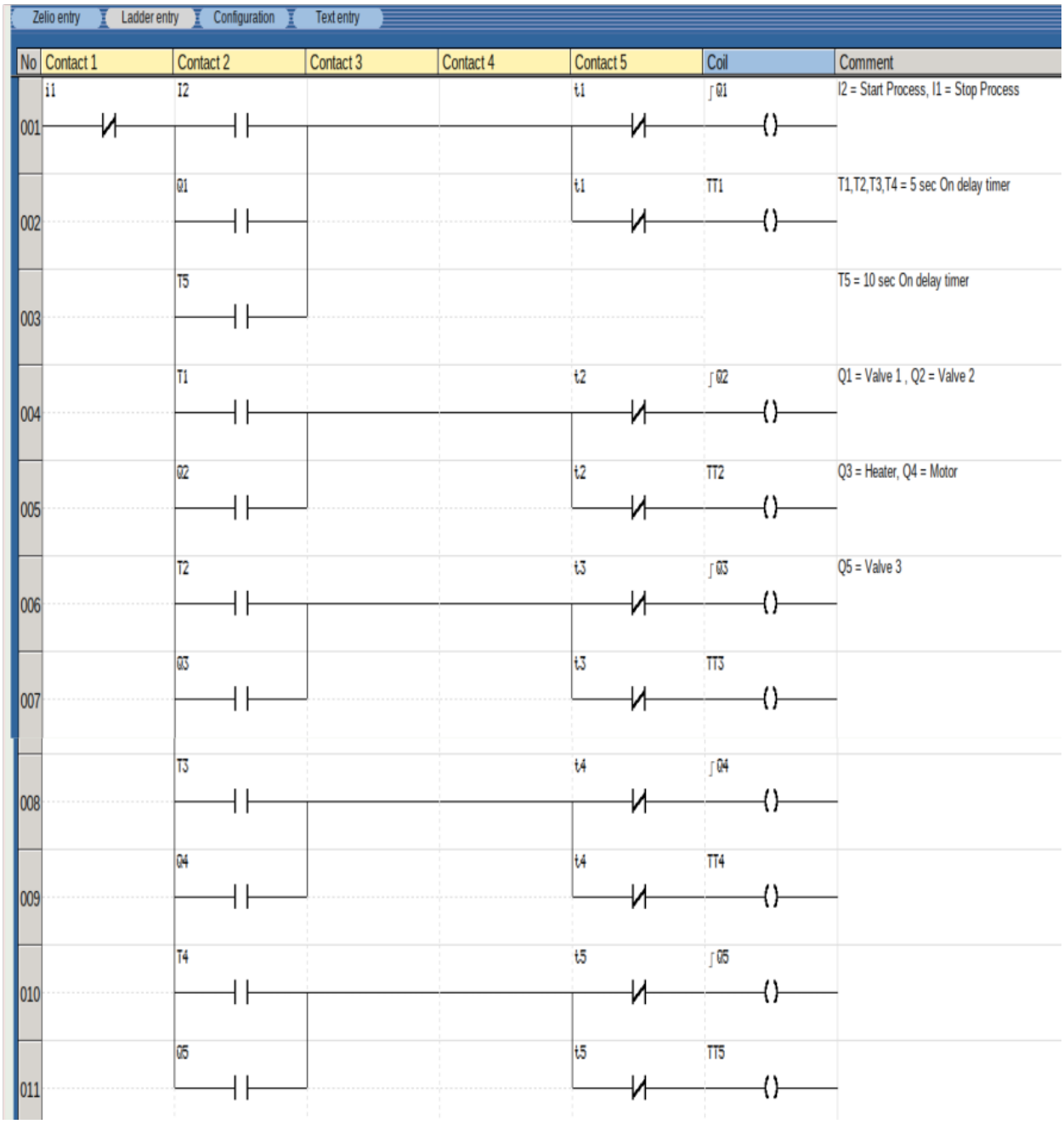
Program #16

In Automatic blending process there are sequence of operations are going to held as per flowchart and design ladder logic for it.

Flow chart of problem 16



Answer.

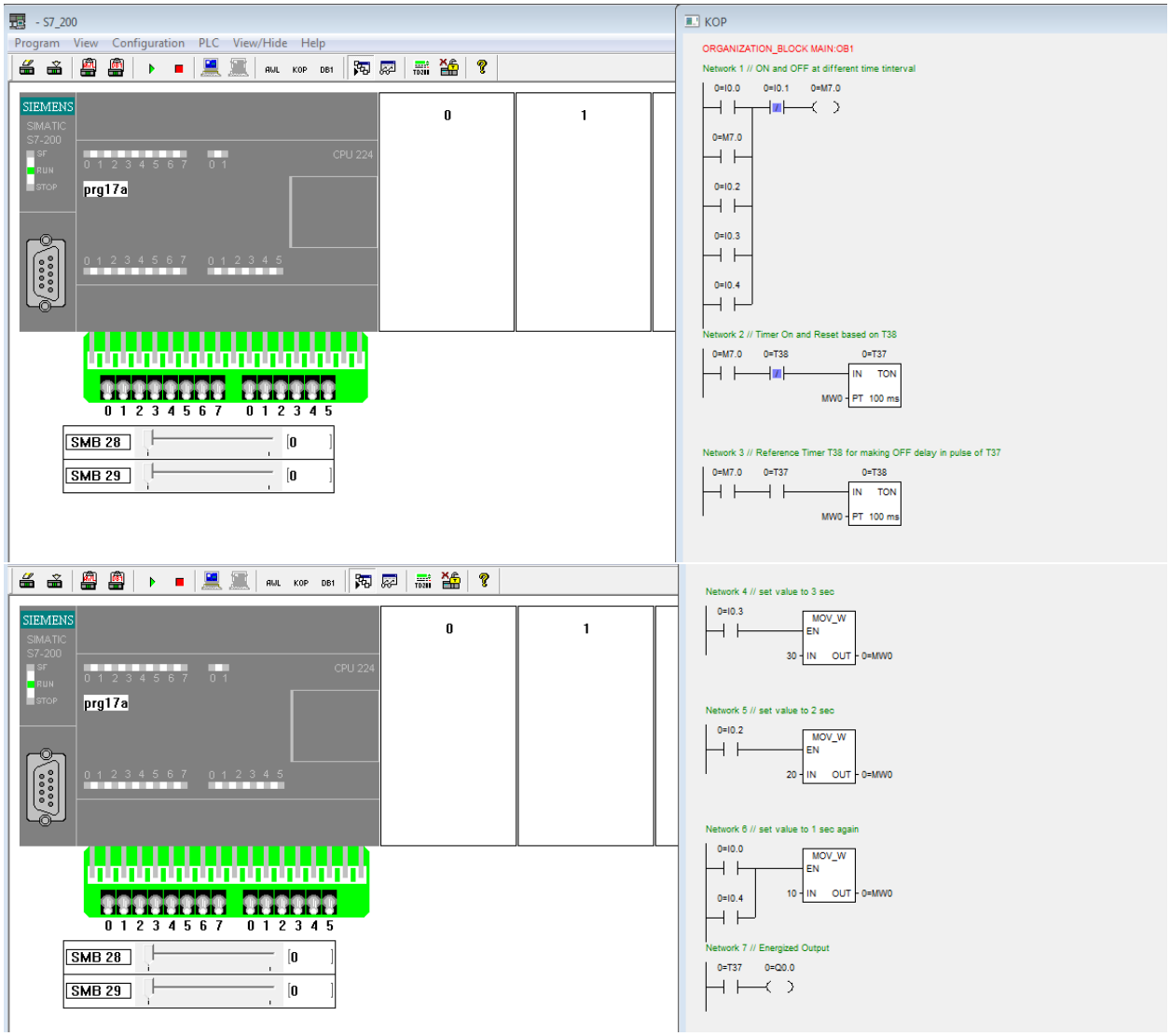


Program #17

When Process start One Light blinking at varying frequency as stated below

- when 1st push button is pressed Light is On and OFF at every 1 second
- when 2nd push button is pressed Light is On and OFF at every 2 second
- when 3rd push button is pressed Light is On and OFF at every 3 second
- when 4th push button is pressed Light is flickering at 0.5 Hz frequency.

Answer.

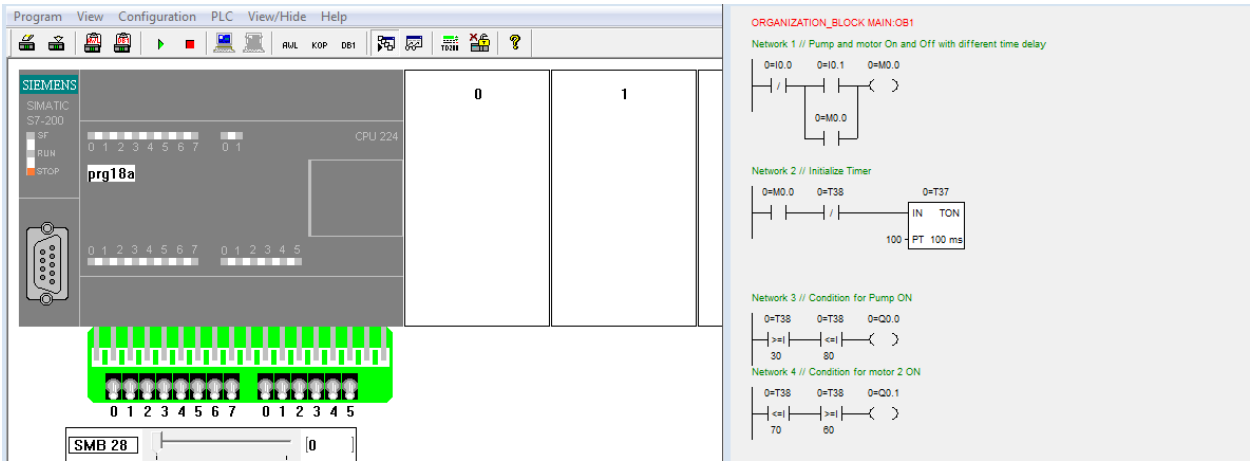


Program #18

In one process when start PB is pressed Timer starts

- when Timer reach to 3 sec PUMP ON
- when Timer reach to 6 sec Motor ON
- when Timer reach to 7 sec Motor OFF
- when Timer reach to 8 sec PUMP OFF

Answer.

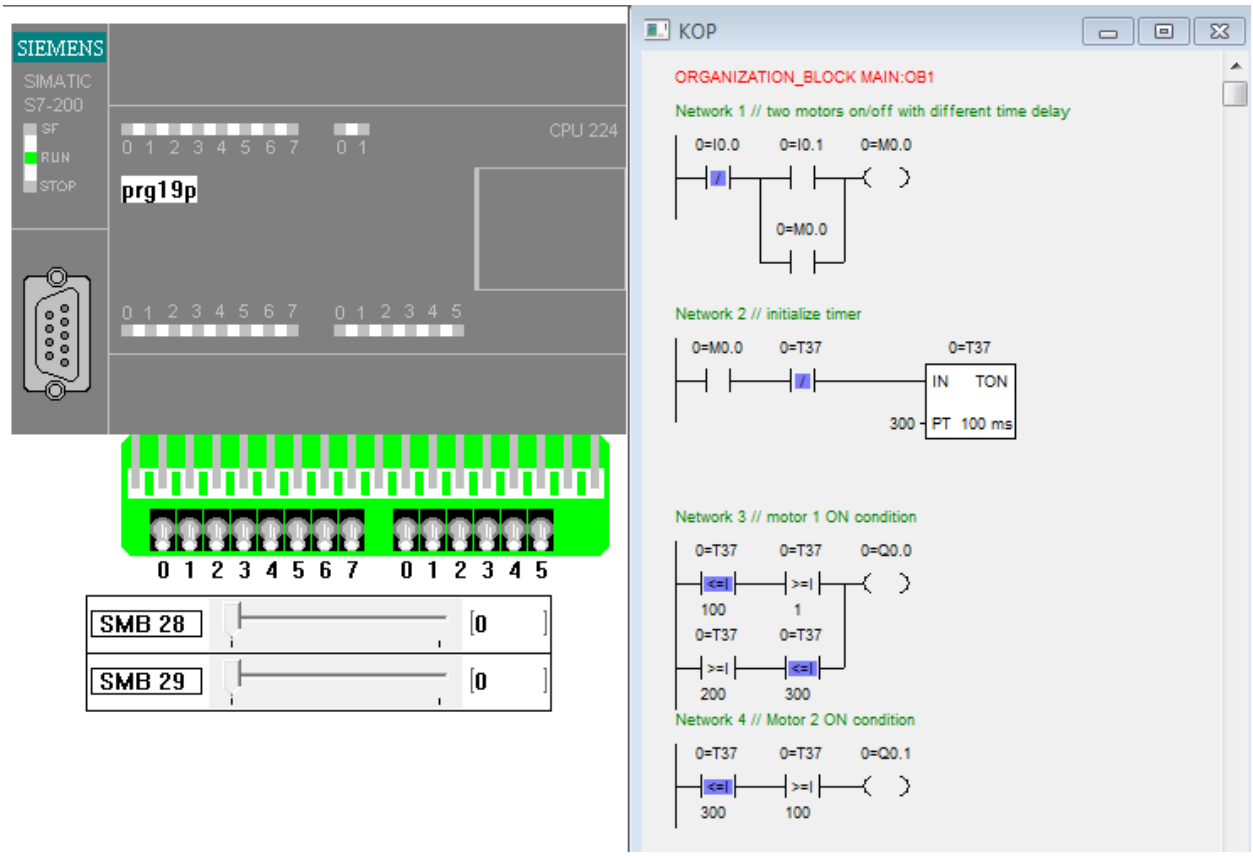


Program #19

There are two no of motors, when Start PB is pressed Timer starts

- from time interval 0 to 10 sec Motor1 ON
- from time interval 10 to 20 sec Motor2 ON
- from time interval 20 to 30 sec Motor1 and Motor2 ON

Answer.

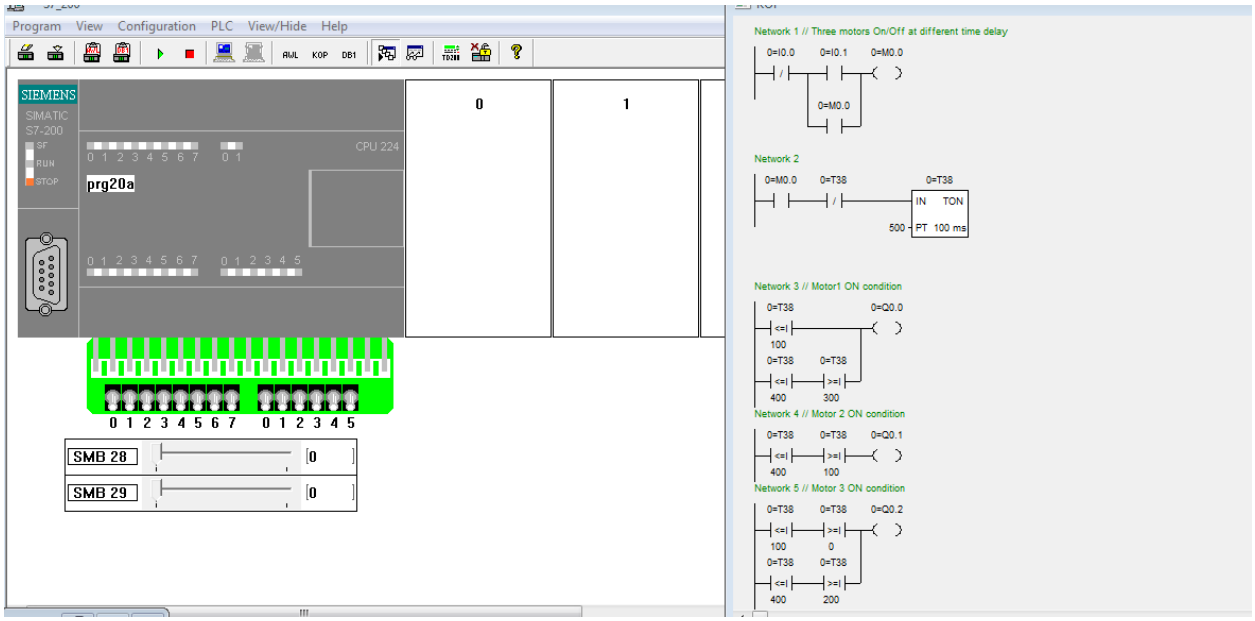


Program #20

There are three no of motors, when Start PB is pressed Timer starts

- from time interval 0 to 10 sec Motor1 & Motor3 ON
- from time interval 10 to 20 sec Motor2 ON
- from time interval 20 t0 30 sec Motor2 & Motor3 ON
- from time interval 30 to 40 sec All Motors ON
- when time in seconds > 40 sec All motors OFF

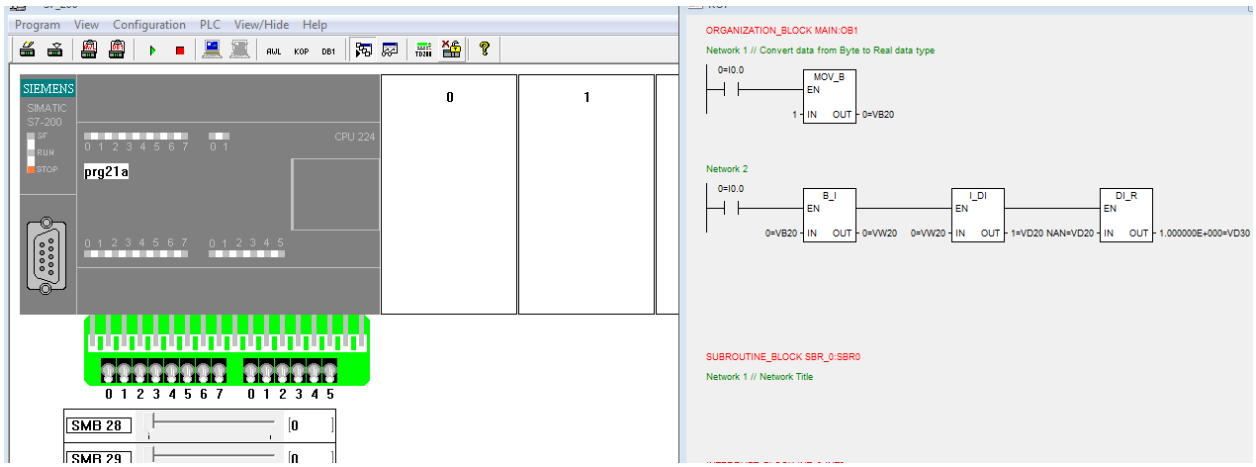
Answer.



Program #21

Convert data that stored in Byte into real data Or convert data into %VBXX into Real value.

Answer.

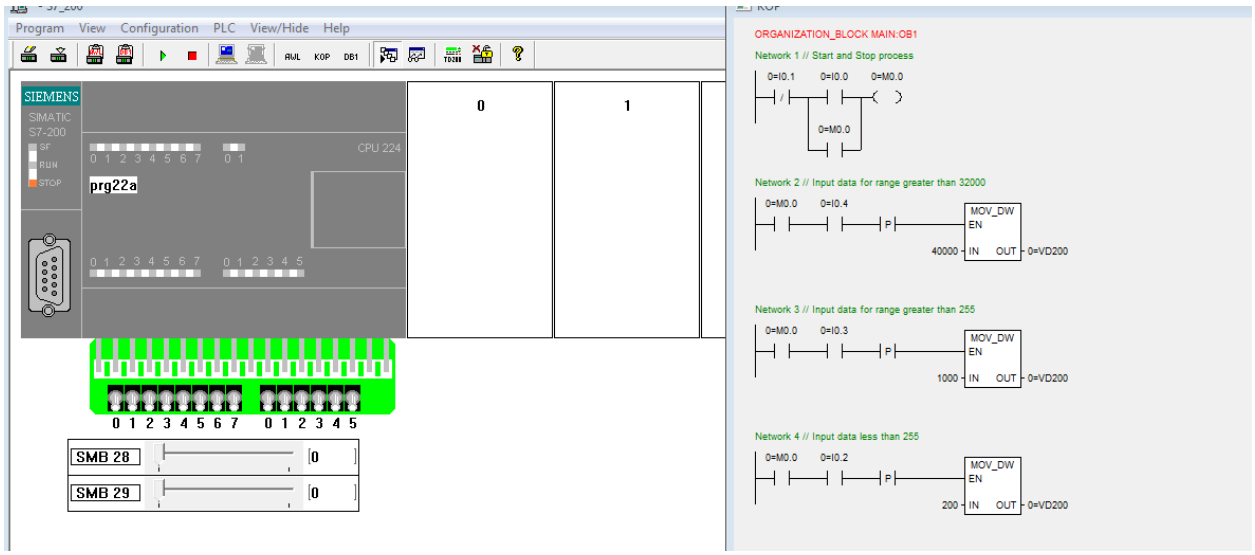


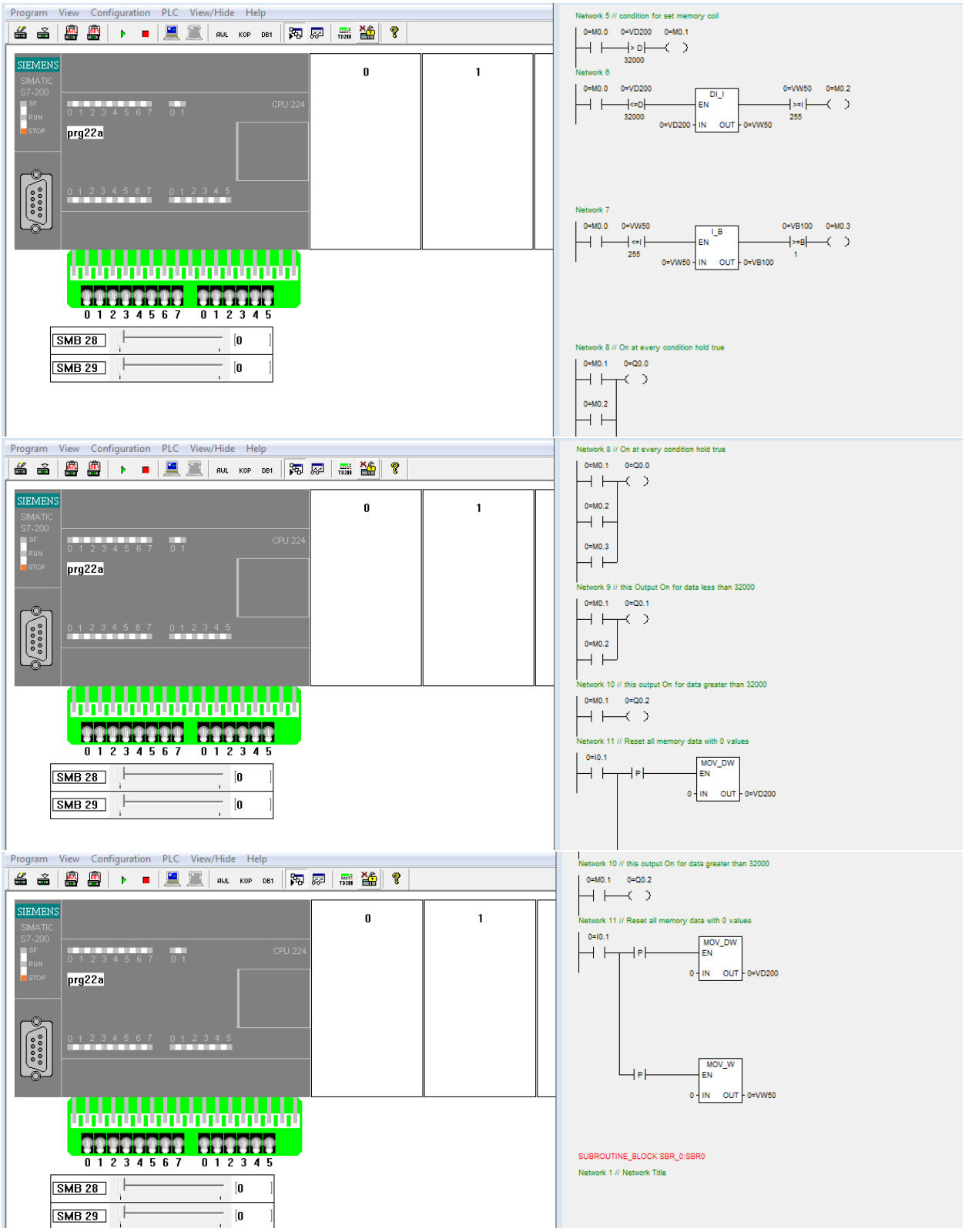
Program #22

Design a programme in which there is input of data available from User/HMI

- if input data is $\leq$ 255 then convert it into byte data type and store into(%VBXX) and also energized one output.
- if input data is $\leq$ 32000 and $\geq$ 256 then convert it into integer data type and store into(%VWXX) and also energized two outputs.
- if input data is $>$ 32000, then energized three outputs.

Answer.



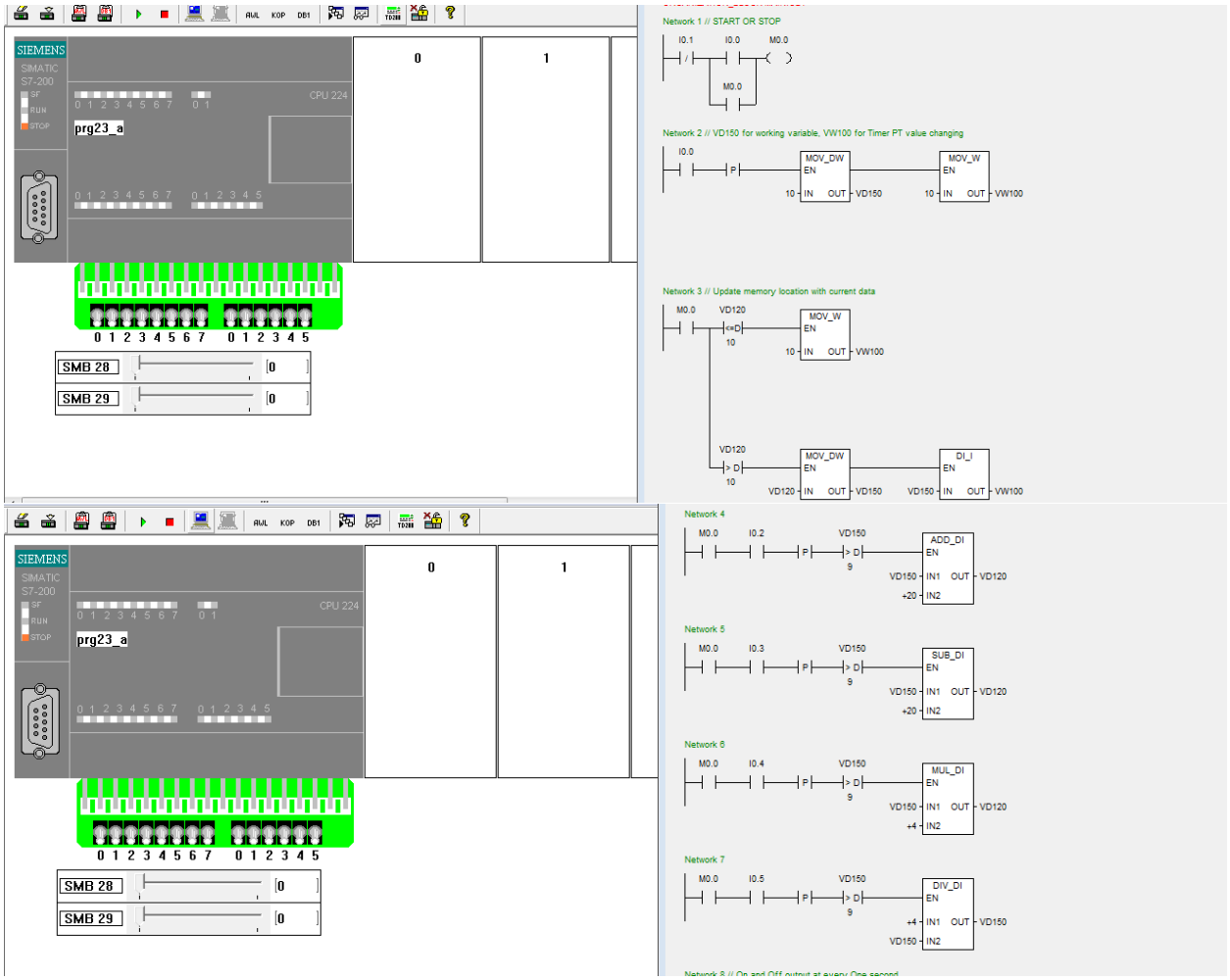

Program View Configuration PLC View/Hide Help
SIEMENS
SIMATIC S7-200
CPU 224
prg22a
0 1
SMB 28
SMB 29
Network 5 // condition for set memory coil
0=M0.0 0=VD200 0=M0.1
> D
32000
Network 6
0=M0.0 0=VD200 DI_I 0=VW50 0=M0.2
<=D >=I
32000 255
0=VD200 IN OUT 0=VW50
Network 7
0=M0.0 0=VW50 I_B 0=VB100 0=M0.3
<=I >=B
255 1
0=VW50 IN OUT 0=VB100
Network 8 // On at every condition hold true
0=M0.1 0=Q0.0
0=M0.2
Network 9 // this Output On for data less than 32000
0=M0.3
Network 10 // this output On for data greater than 32000
Network 11 // Reset all memory data with 0 values
0=I0.1
MOV_DW
EN
P
0 IN OUT 0=VD200
MOV_W
0=VW50
SUBROUTINE_BLOCK SBR_0:SBR0
Network 1 // Network Title

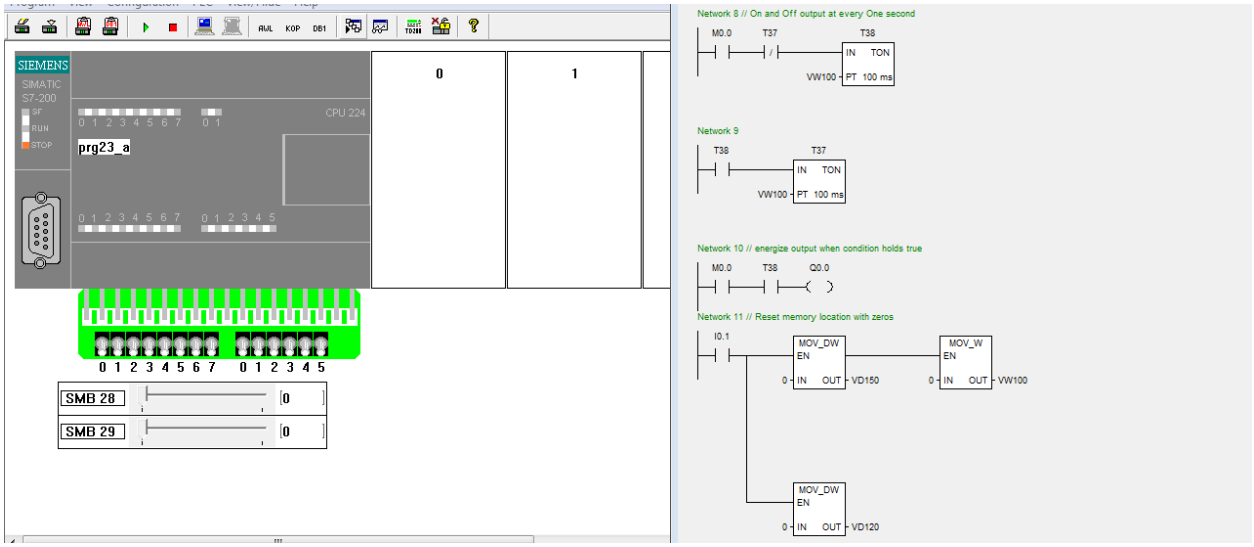
Program #23

When one Process starts: 1 light On and Off at one seconds(Current time interval = 2(1 sec ON + 1 sec OFF) sec)

- when PB1 is pressed same light On and Off at 3 seconds (current time interval + 2) sec
- When PB2 is pressed same light On and OFF at (current time interval – 2) sec
- When PB3 is pressed same light On and OFF at (current time interval * 4) sec
- When PB4 is pressed same Light On and OFF at (current time interval / 4) sec
- minimum time for On and OFF is 1 second, if above mathematical Operation achieves Higher than frequency 0.5 Hz than set it to again at 0.5 Hz.
- if same button is pressed again particular arithmatic operation as per above condition is applied on current time interval

Answer.



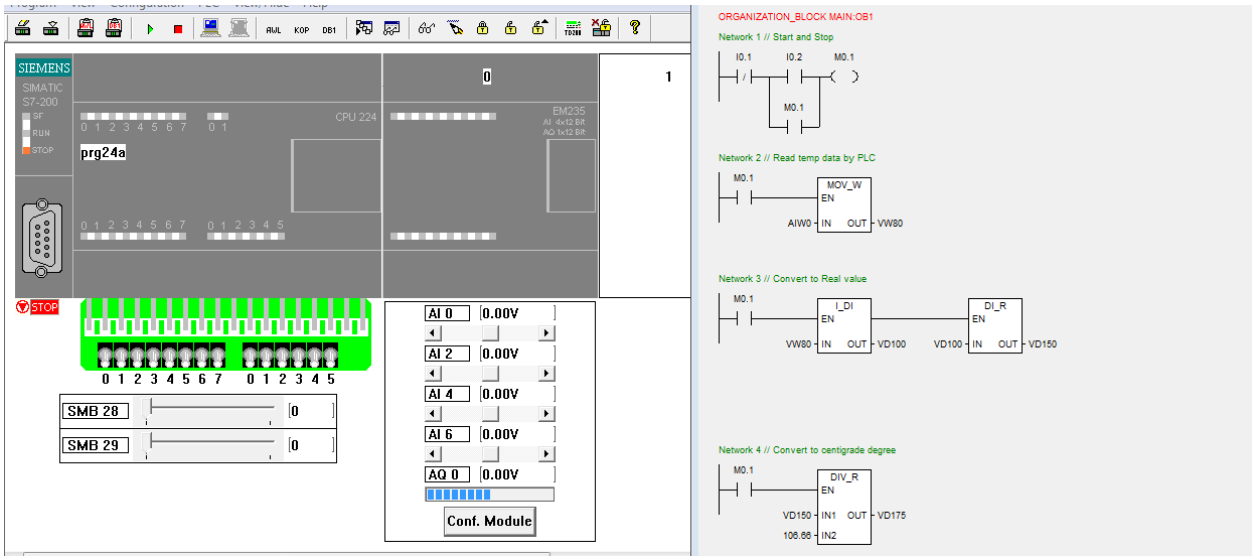


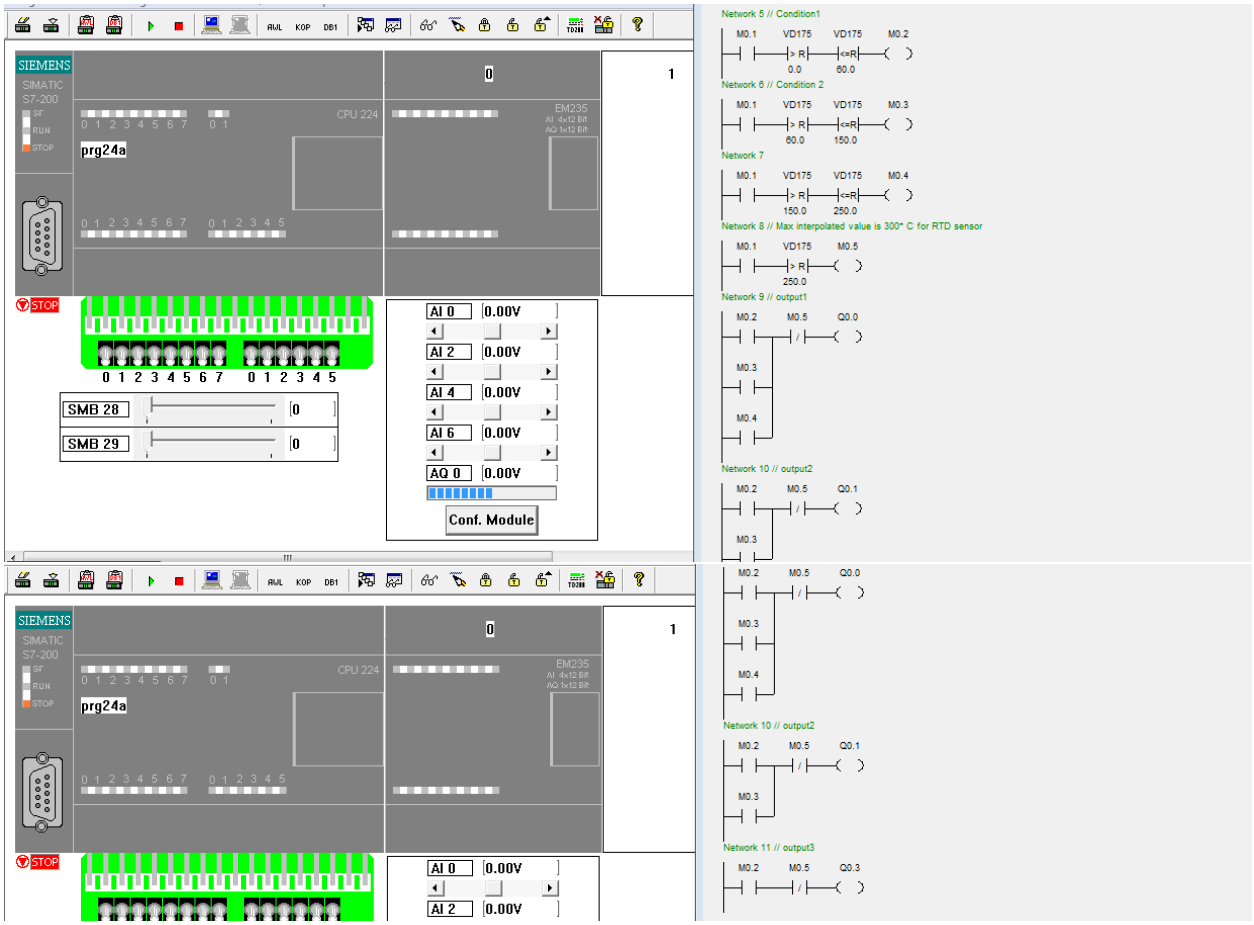
Program #24

There are three heaters and one RTD sensor with transmitter connected with PLC.(eg PLC will read analog value in AIW0 From from 0 to 32000 counts) where 0^oC to 300^oC data transmit by interpolating with current signal of 4 to 20mA

- when temp is $\lesssim 60^o$, All three heaters ON
- when $60 < temp \lesssim 150$, any Two heaters will be ON
- when $150 < temp \lesssim 250$, Only one heater will be ON
- when temp > 250 , All heaters should be OFF

Answer.



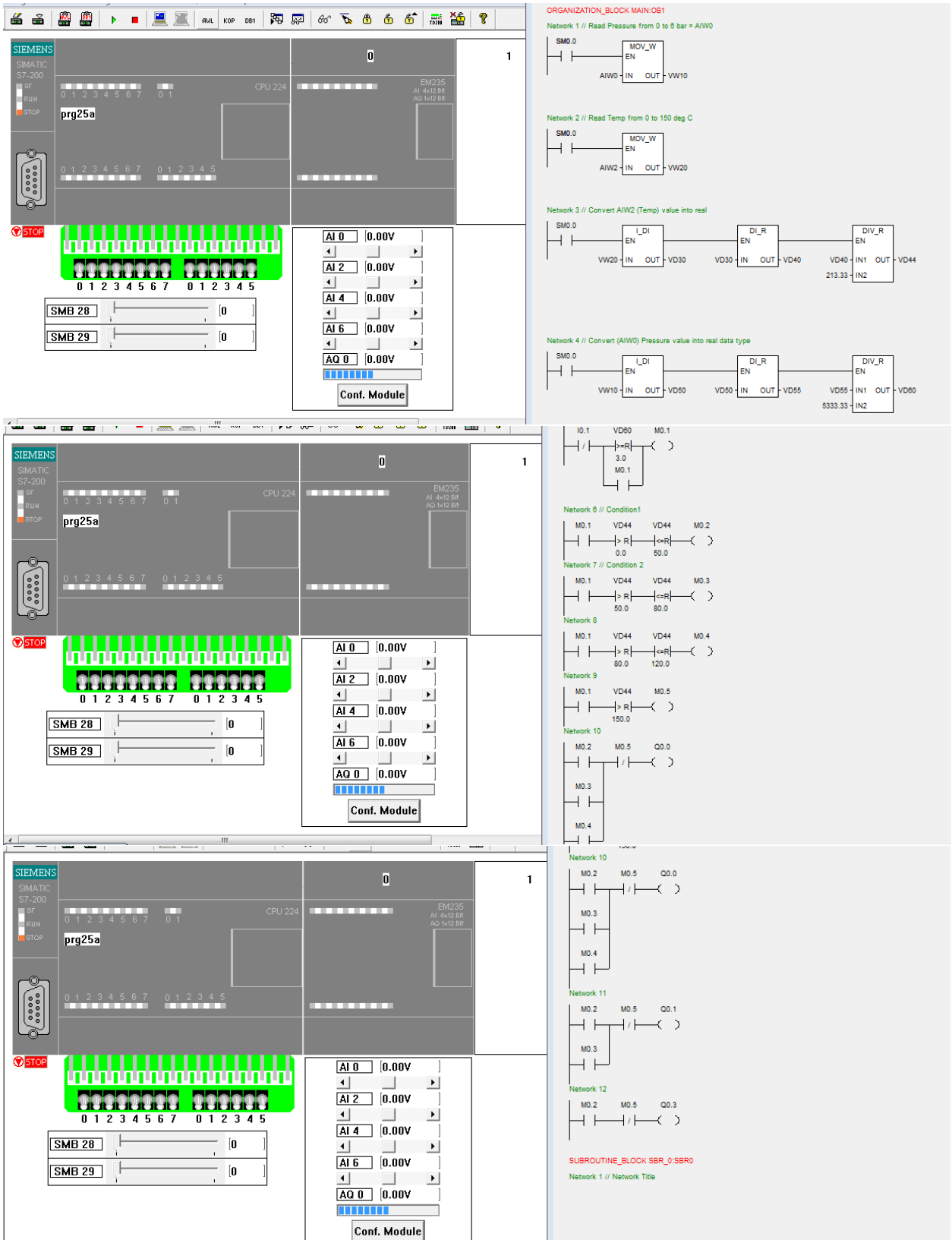


Program #25

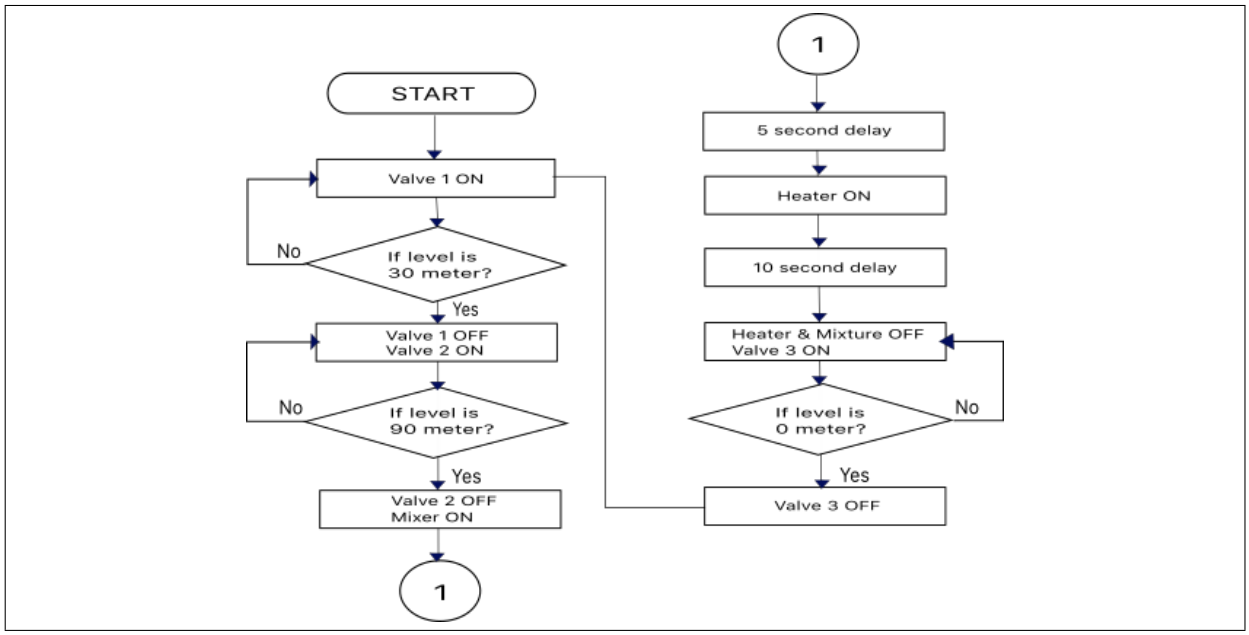
In a process, there are two sensors and 3 Outputs in which one is pressure sensor that is read value from 0 to 6 bar, and one temperature sensor use to control three heaters as per below condition.

- Process is start only if pressure is grater than 3 bar
- when temp is less than 50^oC all heaters will be ON
- when $50^0C < temp \lesssim 80^oC$ two heaeters will be ON
- when $80^0C < temp \lesssim 150^oC$ only one heater will be ON
- when temp > 120^0C All heaters should be OFF

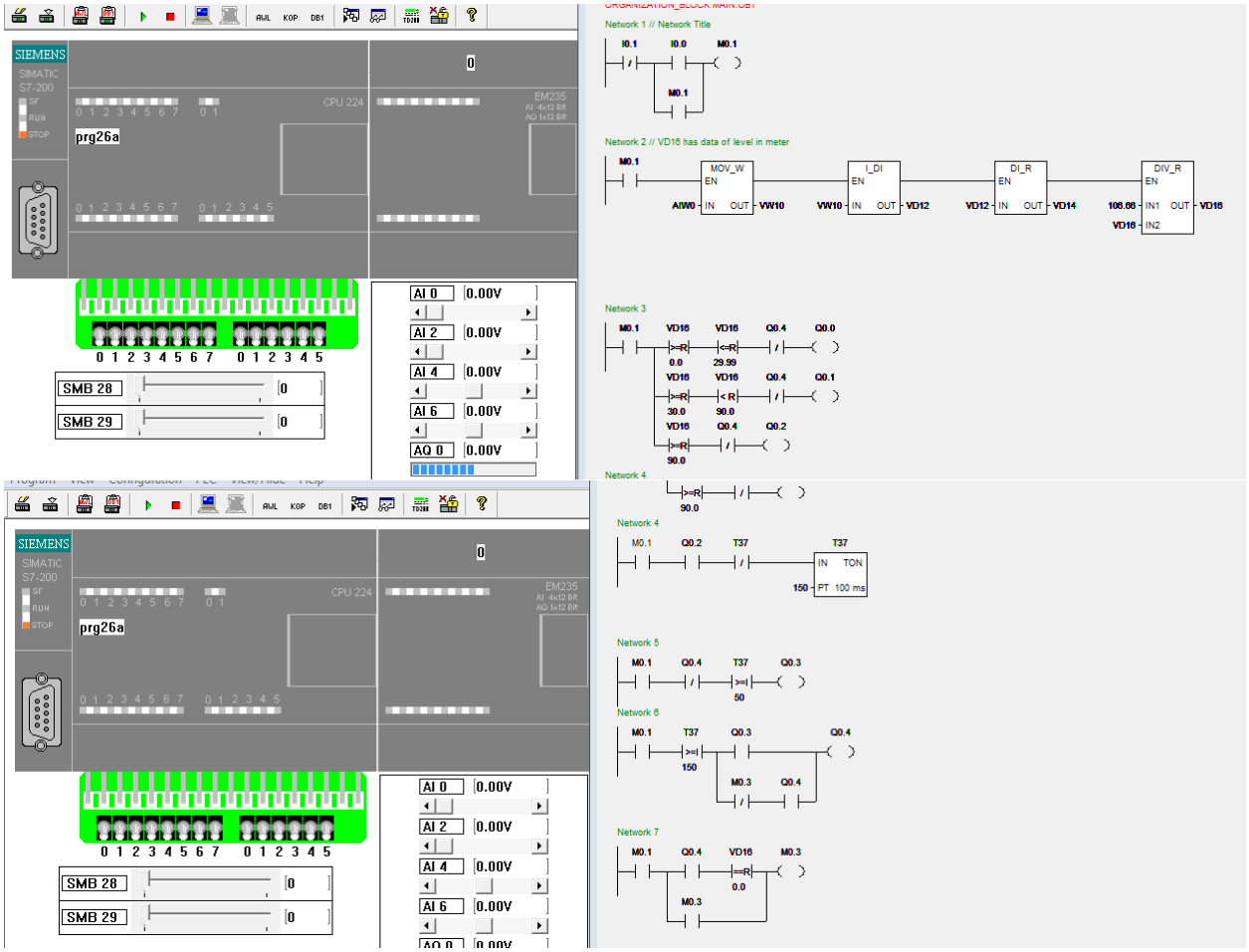
Answer.


SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg25a
STOP
SMB 28
SMB 29
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 0.00V
Conf. Module
ORGANIZATION_BLOCK MAIN:OB1
Network 1 // Read Pressure from 0 to 6 bar = AIW0
Network 2 // Read Temp from 0 to 150 deg C
Network 3 // Convert AIW2 (Temp) value into real
Network 4 // Convert (AIW0) Pressure value into real data type
Network 6 // Condition1
Network 7 // Condition 2
Network 8
Network 9
Network 10
Network 11
Network 12
SUBROUTINE_BLOCK SBR_0:SBR0
Network 1 // Network Title

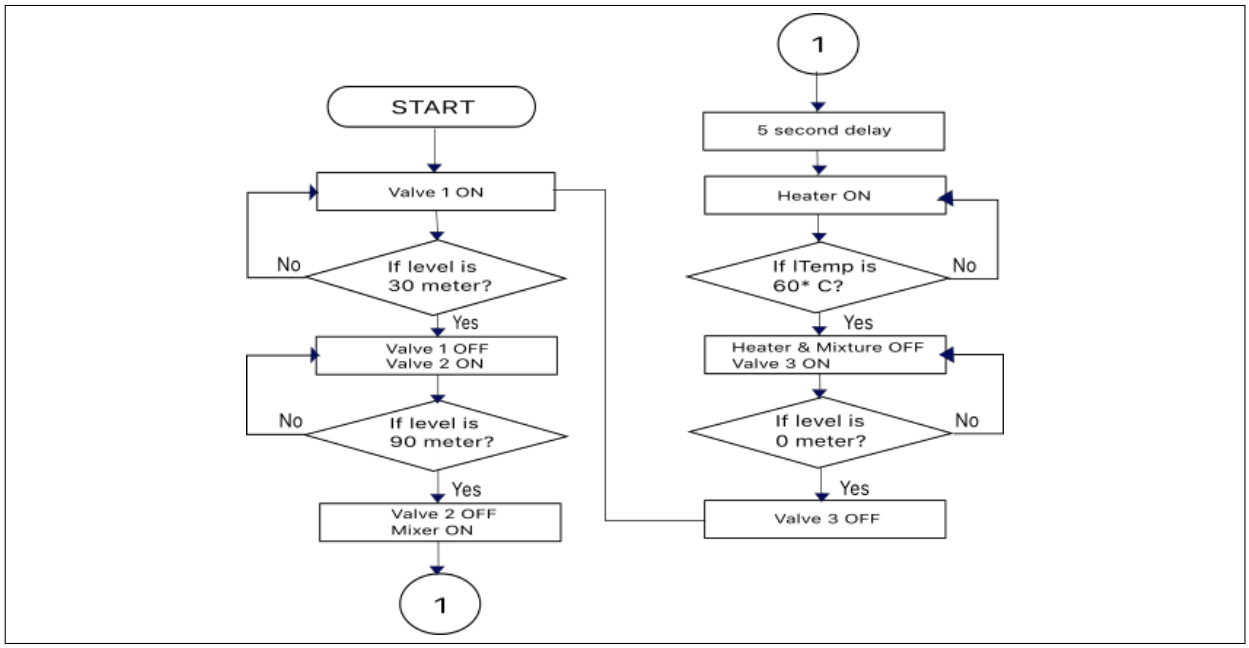
Program #26



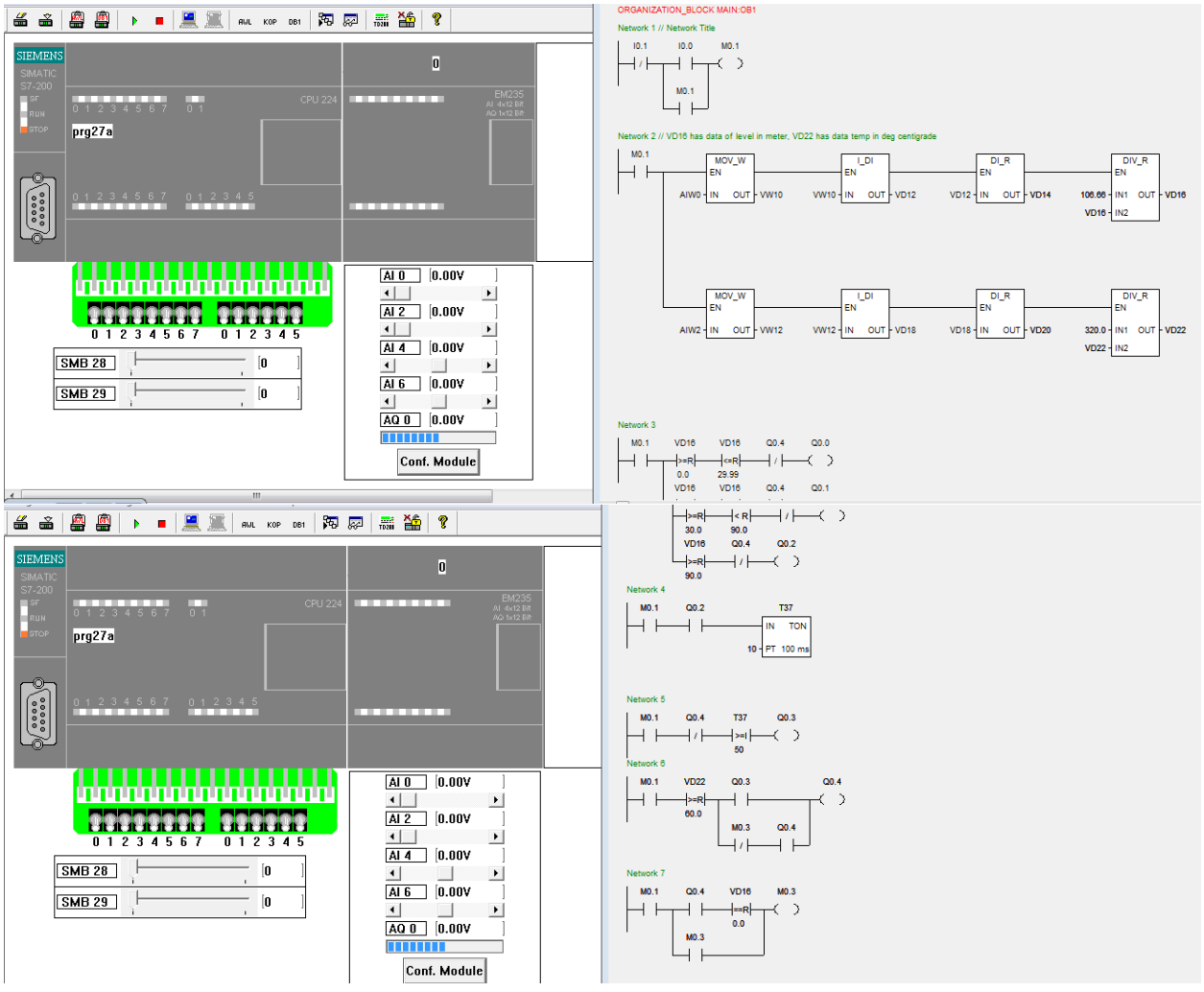
Answer.



Program #27



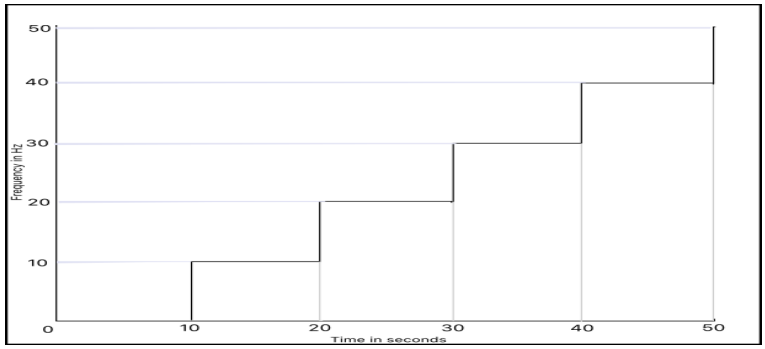
Answer.



Program #28

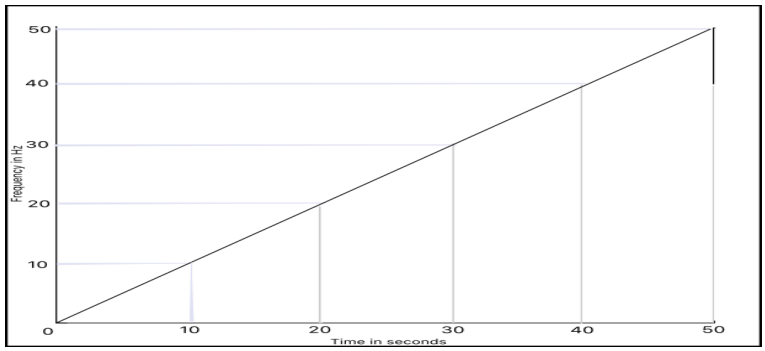
There is one Induction motor with synchronous speed of 1500 RPM, so design a ladder logic in such a way that IM will start by increasing its peed in some discrete interval as shown in figure. where total time delay to achieve full load speed is 50 sec given.

1. Increase speed in 5 such different discrete interval as shown in figure

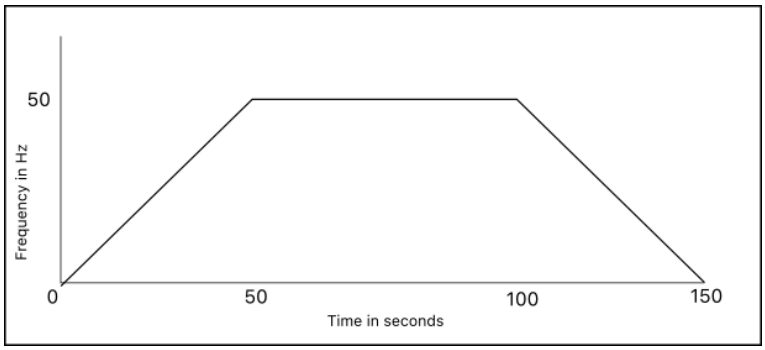


2. design part(a) with different universal logic

3. increase speed in 50 such different discrete interval, or more fine linear increasing manner

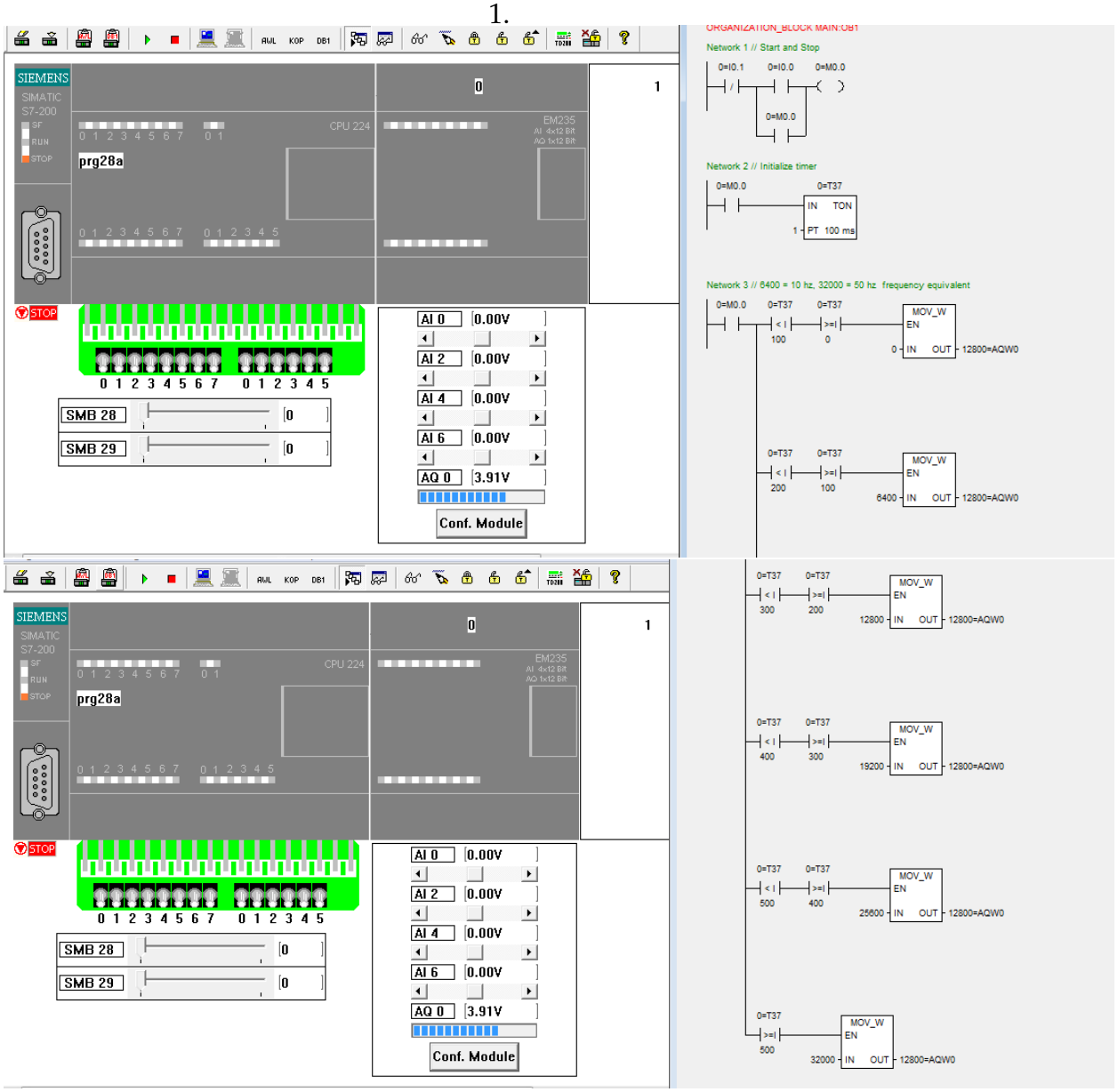


4. increase speed with 50 discrete levels in 50 sec and after 100 sec decrease speed with same levels in same time interval

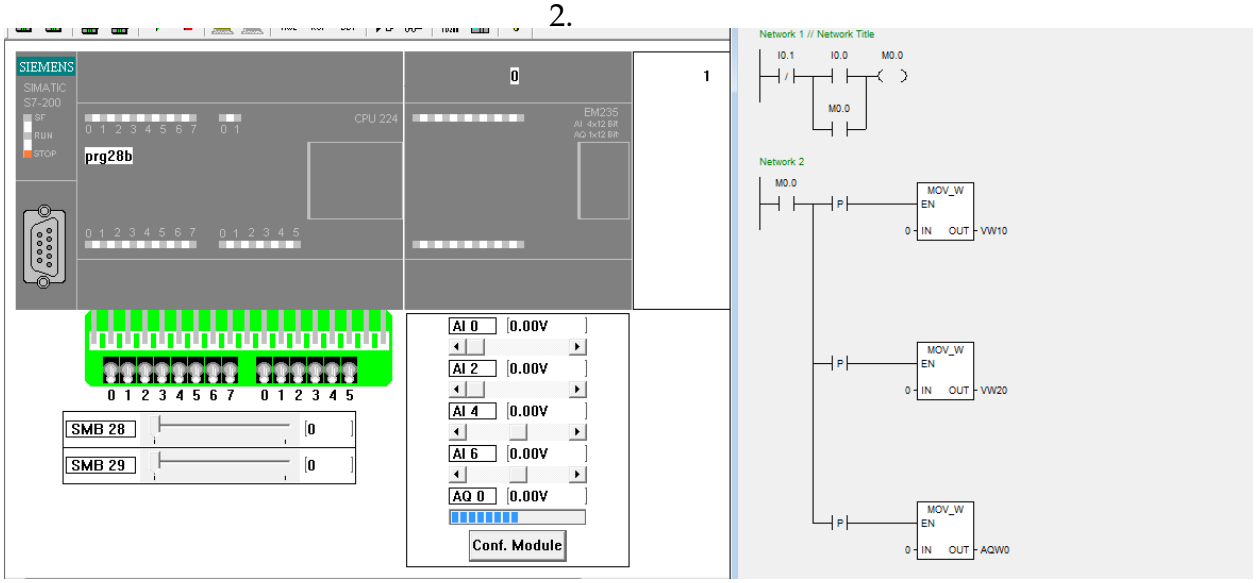


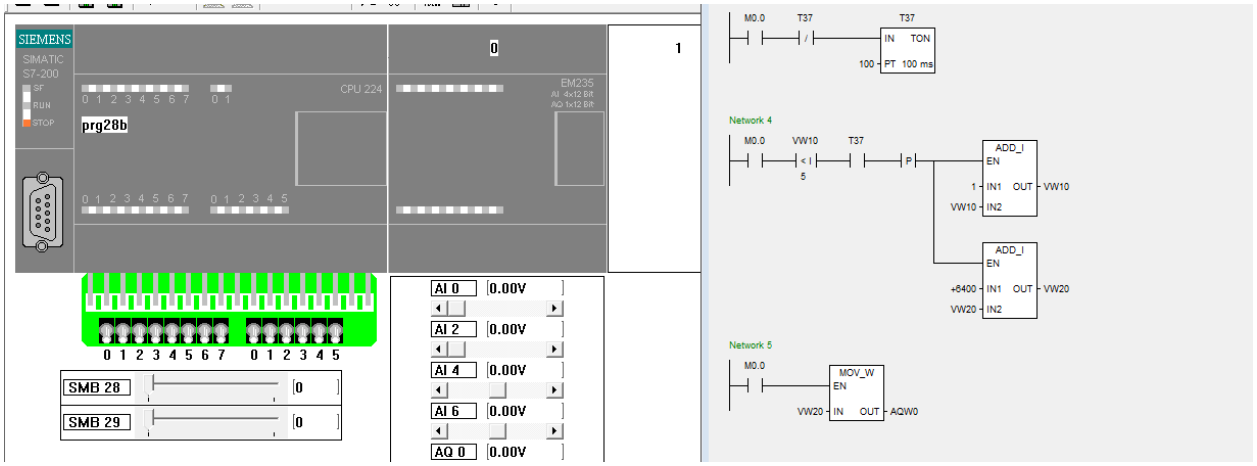
Answer.

1.

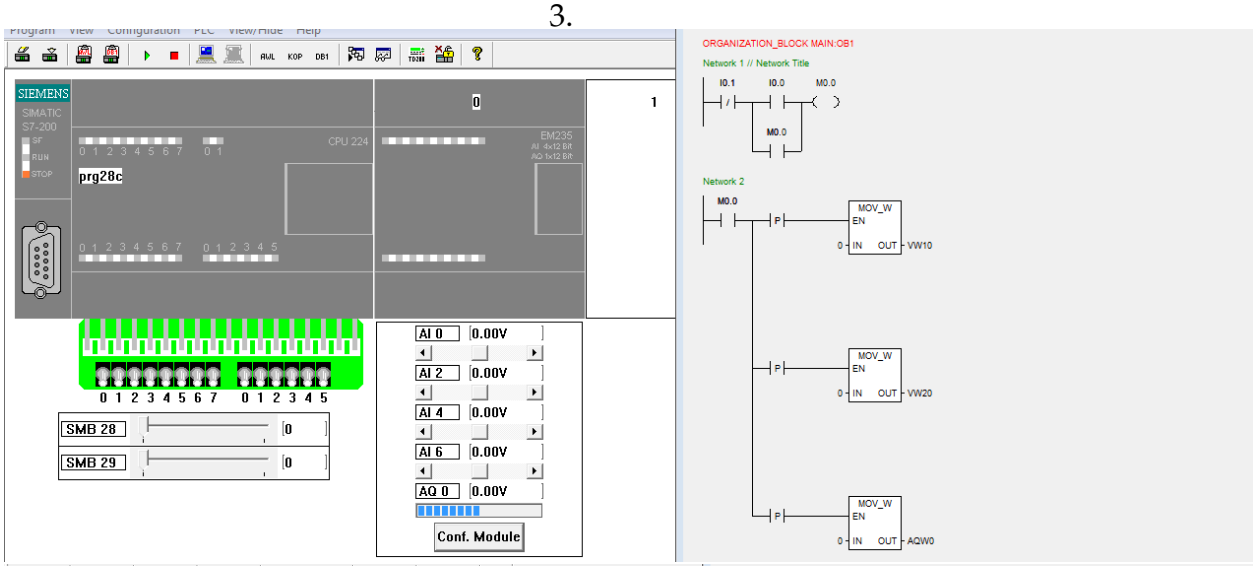

SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28a
STOP
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 3.91V
Conf. Module
SMB 28
SMB 29
Network 1 // Start and Stop
Network 2 // Initialize timer
Network 3 // 6400 = 10 hz, 32000 = 50 hz frequency equivalent
MOV_W
12800=AQW0

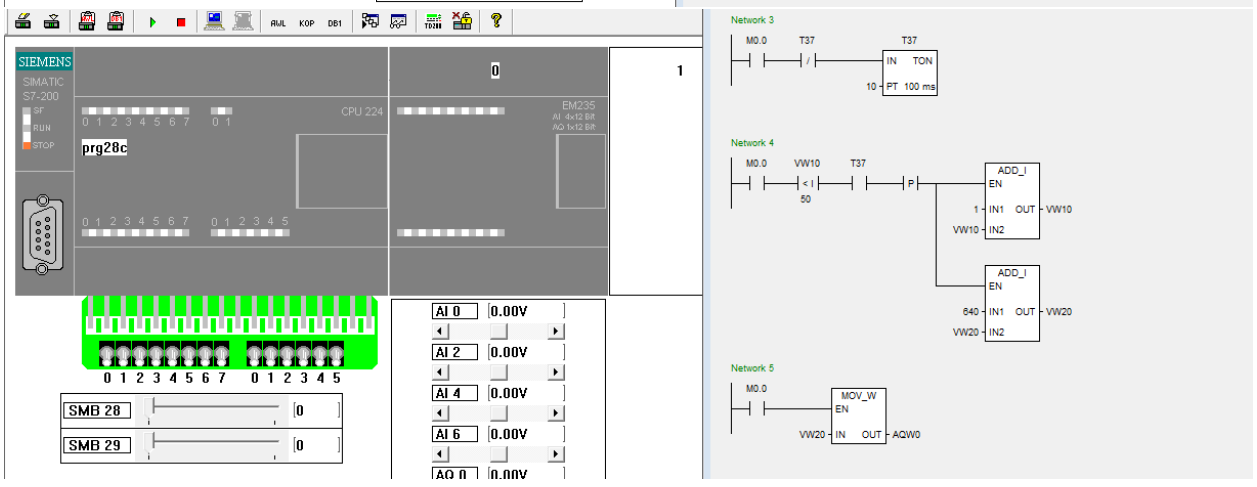
2.


SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28b
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 0.00V
Conf. Module
SMB 28
SMB 29
Network 1 // Network Title
Network 2
MOV_W
VW10
VW20
AQW0

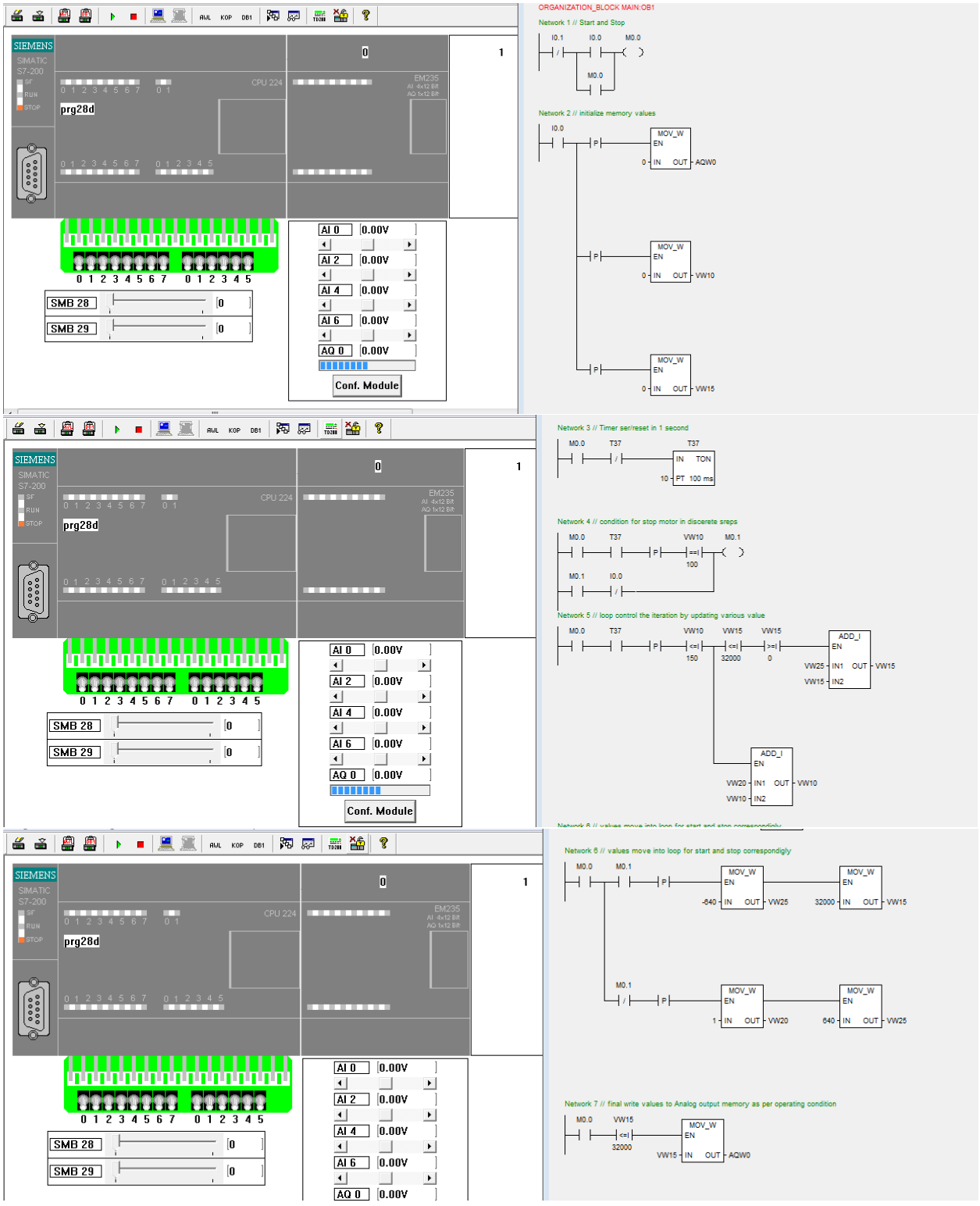

SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28b
SMB 28
SMB 29
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 0.00V
M0.0 T37 T37 IN TON 100 PT 100 ms
Network 4
M0.0 VW10 T37 ADD_I EN 1 IN1 OUT VW10 VW10 IN2
ADD_I EN +6400 IN1 OUT VW20 VW20 IN2
Network 5
M0.0 MOV_W EN VW20 IN OUT AQW0

3.


SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28c
SMB 28
SMB 29
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 0.00V
Conf. Module
ORGANIZATION_BLOCK MAIN:OB1
Network 1 // Network Title
I0.1 I0.0 M0.0 M0.0
Network 2
M0.0 MOV_W EN 0 IN OUT VW10
MOV_W EN 0 IN OUT VW20
MOV_W EN 0 IN OUT AQW0


SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28c
SMB 28
SMB 29
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
Network 3
M0.0 T37 T37 IN TON 10 PT 100 ms
Network 4
M0.0 VW10 T37 ADD_I EN 1 IN1 OUT VW10 VW10 IN2
ADD_I EN 640 IN1 OUT VW20 VW20 IN2
Network 5
M0.0 MOV_W EN VW20 IN OUT AQW0

4.


SIEMENS
SIMATIC S7-200
CPU 224
EM235
prg28d
AI 0 0.00V
AI 2 0.00V
AI 4 0.00V
AI 6 0.00V
AQ 0 0.00V
Conf. Module
SMB 28
SMB 29
ORGANIZATION_BLOCK MAIN:OB1
Network 1 // Start and Stop
Network 2 // initialize memory values
MOV_W
AQW0
VW10
VW15
Network 3 // Timer ser/reset in 1 second
T37
TON
100 ms
Network 4 // condition for stop motor in discerete sreps
Network 5 // loop control the iteration by updating various value
ADD_I
Network 6 // values move into loop for start and stop correspondigly
Network 7 // final write values to Analog output memory as per operating condition