

- [1-a] i- Give two definitions of PLC. [ 8 marks ]  
ii- State the different types of PLC.  
iii- Explain in brief with the aid of drawing PLC internal architecture.

- [1-b] Write short notes on :- [ 12 marks ]  
\* Selection Criteria of PLC.  
\* PLC Programming Languages.  
\* Commissioning and Documentation.  
\* Elements and applications of SCADA system.

- [1-c] Draw a ladder diagram to control an automatic door which is to be open when a person approach it from inside or outside , and remain open for 10 sec. before closing . [ 6 marks ]

- [2-a] Explain in brief the theory of operation of the following:- [ 8 marks ]  
\* Cyclic Timers.  
\* Pneumatic Pistons.  
\* Proximity switches.  
\* Photo electrical switches.

- [2-b] State in brief the function of the following instructions:- [ 6 marks ]  
OSR. LIM. SCP. MOV. TON. CTD.

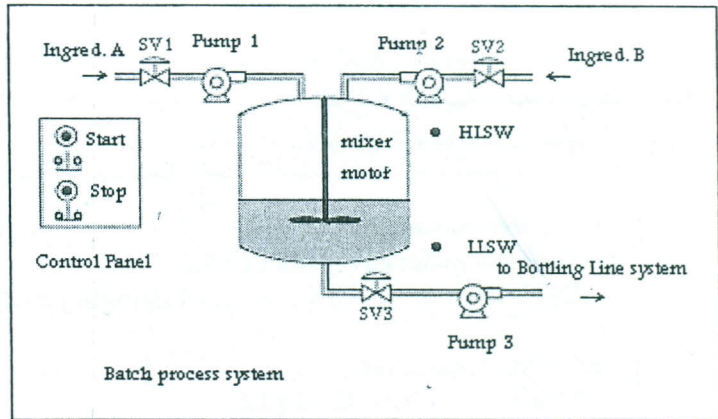
- [2-c] Draw a ladder diagram to simulate 3 stages process control system, the first one takes 5 min., the second one takes 3 min., and the third one takes 15 min., and repeat. [ 6 marks ]

- [3-a] An RTD sensor provides 4-20 mA current signal for 0-200°C is wired at analog input (I:1/0), a digital panel meter which displays the temperature is wired to an output (O:1/0).  
(\* 6241 to 31208 is the calibrated values for 4-20 mA current signal of the RTD sensor)  
Write a ladder program to do the following:- [ 12 marks ]  
1- Display the temperature on digital panel meter.  
2- On Red lamp if the temperature is greater than 45°C.  
3- On Green lamp if the temperature is between 30°C and 45°C.  
4- On Blue lamp if the temperature is less than 30°C.

- [3-b] Develop a ladder logic diagram for PLC based coffee vending machine. Insertion of coin and pushing buttons provides a paper cup with coffee that can be with sugar or without sugar. ( assume suitable input-output devices ). [ 8 marks ]



[4-a] The Batch Process system shown employs mixing of two chemicals ingredient A, and B in process tank for specified time, the solution is then drain out through the outlet valve SV3. SV1 and SV2 are used to fill the process tank with ingredient A and B. HLSW and LLSW are used to detect high level and low level of the solution in the tank.



When the start button is pressed the program starts pump1 for 15 sec. filling the tank with ingredient A, then shuts off, and pump2 runs for 30 sec. filling the tank with ingredient B, then shuts off.

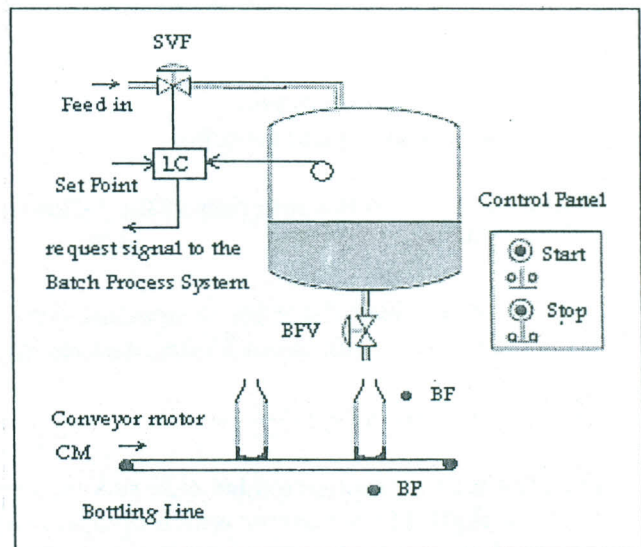
The program starts the mixer motor for 60 sec., then the program opens the outlet valve SV3 and starts pump3 according to a request signal coming from Bottling Line system.

Please do the following:-

[ 12 marks ]

- i- Write the IOL table.
- ii- Draw the timing diagram.
- iii- Device a ladder diagram to control the Batch Process system.

[4-b] In the Bottling Line shown the level control system LC is used to maintain the level of the tank at the set point by controlling the Feed in control valve SVF, when the outlet valve BFV is open and bottle is filling with liquid. However that periodically an empty bottle comes into position under the outlet valve, the BP sensor is used to detect the bottle present condition, the BF sensor is used to detect the bottle fill condition. When the start button is pressed the program starts the conveyor motor CM to drive a transporting system , when an empty bottle trigger a limit switch BP, motor CM stops and the valve BFV starting filling an empty bottle, after filling the empty bottle, the valve BFV is closed, and the motor CM restart running again. After filling 25 bottles a packing system must be started , and the counter must be reset .



Please do the following:-

[ 12 marks ]

- i- Write the IOL table.
- ii- Device the ladder diagram.
- iii- Convert the ladder diagram into an instruction list code.

QUESTION 1

- A. What is the difference between FAR and NEAR?
- B. What is the meaning of DIRECTIVE?
- C. What is function of DEBUG utility?
- D. What is the meaning of addressing modes? And list down some of them?
- E. Find the offset address if the base address is D765H and the physical address is DABC0H?

QUESTION 2

- A. Write an Assembly code snippet in DEBUG that can be used to exchange data between the register AX and Register BX
- B. Show how can you change the flag register bits in DEBUG to show [no carry – even parity – negative output – auxiliary carry – no zero result]
- C. Why do we need stack?
- D. All general purpose register and segment register can be pushed and popped from the stack — comment pls.?

QUESTION 3

- (a) Assuming that  $AX = 0123_{16}$  and  $BL = 10_{16}$ , what will be the new contents of AX after executing the instruction `DIV BL`?
- (b) If AL contains  $A0_{16}$ , what happens when the instruction `CBW` is executed?
- (c) Specify the relation between the old and new contents of AX after executing the following sequence of instructions `NOT AX`     `ADD AX,1`
- (d) Write an instruction that when executed will mask off all but bit 7 of the contents of the data register
- (e) Write a single instruction that will load AX from address  $0200_{16}$  and DS from address  $0202_{16}$
- (f) Write an instruction sequence that will initialize the DS register with the immediate value  $1010_{16}$

QUESTION 4

What operation is performed by each of the following instructions?

- (a) `ADC AX,00FFH`
- (b) `SBB DL,[0200H]`
- (c) `NEG AX`
- (d) `MUL CL`
- (e) `Test CX,4`
- (f) `CMP BX,10`
- (g) `JMP block1`
- (h) `OR AX,AX`
- (i) `XOR CX,CX`

QUESTION 5

- A. Write down an assembly code (just code section) that shows how you can calculate the factorial of a number
- B. Write down an assembly code (just code section) that can print out how many numbers are positive, how many are negative, how many equal zero
- C. Write down an assembly program (all the code) to count how many characters are in a phrase ended with an ENTER key.

QUESTION 6

Simulate the high-level language code below to an assembly code

- (a)  $A = 5 - A$   
*Starting with `MOV AX,5`*
- (b)  $A = B - 2 * A$   
*Starting with `MOV AX,B`*
- (c)  $A = -(A+1)$   
*Starting with `MOV AX,A`*
- (d)  $C = A + B$
- (e)  $B = 3 * B + 7$
- (f) SWITCH – CASE Keyword
- (g) IF-THEN-END
- (h) WHILE LOOP