Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09]

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Uni. Roll No. ....

Program/ Course: **B.Tech. (Sem. 6ᵗʰ)**
PLC and Industrial Drives
Subject Code: **PCEE-115**
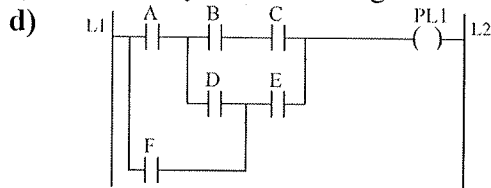Paper ID: **17227**

Time Allowed: 03 Hours

Max. Marks: 60

Note:
1) Parts **A** and **B** are compulsory
2) Part-C has Two Questions **Q8** and **Q9**. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately

Section – A   [Marks: 02 each]

Q1. a) Draw PLC scan cycle.
b) Enlist any four types of PLC programming.
c) State any four advantages of AC drives.
d)

Identify the fault in the above ladder diargram.
e) Draw the ladder logic diagram of NOR gate.
f) Give classification of electric drive system.
j) Draw the diagram of a 4-Quadrant drive.

Section – B   [Marks: 04 each]

Q2. Illustrate different types of timers used in PLC. Briefly explain each of them with a suitable application example for each.

Q3. Draw a ladder diagram that will cause the output, pilot light PL2, to be on when selector switch SS2 is closed, push button PB4 is closed and limit switch LS3 is open.

Q4. Draw the generic block diagram of a PLC. Explain in brief the role of different blocks.

Q5. Draw the speed torque characteristics of mechanical loads. Explain in brief each characteristic curve.

Q6. Draw the diagram showing the main components of an AC drive system.

Q7. A motor operates on a periodic duty cycle which it is clutched to its load for 10 minutes and declutched to run on no-load for 20 minutes. Minimum temperature rise is 40°C. Heating and cooling time constants are equal and have a value of 60 minutes. When the load is declutched continuously the temperature rise is 15°C.
Determine **i)** Maximum temperature during the duty cycle and **ii)** Temperature when the

P.T.O.

load is clutched continuously.

Section – C [Marks: 12 each]

Q8. Figure 1 below shows a process in which two chemicals, A and B, are mixed together. S1, S2, and S3 are level switches of the NC (normally closed) type that change state when the fluid reaches the level in question. T_s is a temperature sensor. The facility also has a starting button, START and a STOP button, Stop1.

The facility is to function as follows:

1. At the signal to start, valve A opens.
2. At level S2, valve A closes, the heating element is turned on, the agitator starts, and valve B opens.
3. At level S3, valve B closes.
4. When 70°C is reached, a timer is activated. 45 seconds after, the heating is turned off and valve C is opened.
5. Below level S2, the agitator stops.
6. Below level S1, valve C closes and valve A opens again.
7. The sequence is repeated until Stop1 is pressed.
8. Draw the sequence diagram based upon the following assumptions.

Assume that the tank is empty at the start. Note that the level switch is NC type so that it gives a logical high signal when it is not activated.
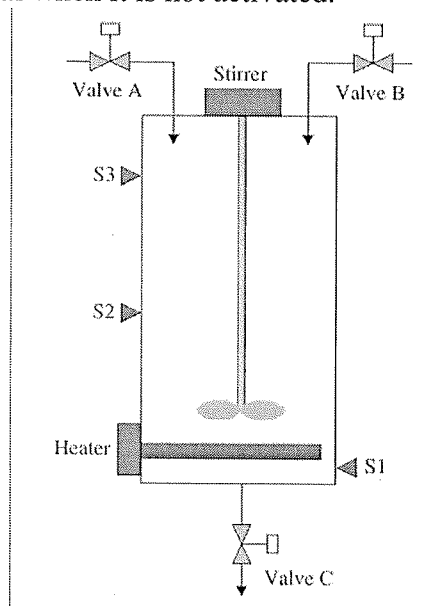

Fig. 1

OR

State differences between hardwired system and PLC citing their advantages and disadvantages.

Q9. Draw and briefly explain different types of converter technologies used for VFD design for induction motor mentioning their advantages and disadvantages over each other.

OR

Draw the block diagram of flux vector converter control circuit of a 3-phase VSD. Explain its working.

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