D 90311 (Pages : 3) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2015

AI 09 701—PROCESS CONTROL INSTRUMENTATION

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What is self regulation ?
2. When will cascade control give better performance compared to conventional controllers ?
3. Why is identification of a process necessary ?
4. List the advantages of ladder programming over relay logic.
5. What are the factors that decide the power of the processor and how ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Level measurement in a sump tank is provided by a transducer scaled as 0.2 V/m. A pump is to be turned on by the application of a +5V when the sump level exceeds 2 m. The pump is to be turned off when the sump level drops to 1.4 m. Develop a two position controller.
7. Find the working force resulting from 200N applied to a 1cm radius forcing piston, if the working piston has a radius of 6 cm.
8. An equal percentage valve has a range ability of 32. If the maximum flow rate is 100 m^3/h, find the flow at 2/3 and 4/5 open settings.
9. Why is step input most commonly used for the testing of systems ? Explain.
10. A manufacturing operation results in a 30 ms PLC scan time. The PLC must detect individual 2 cm object on a high speed moving conveyor. What is the highest speed of the conveyor to be sure that the object is detected ?
11. Write a PLC program to explain the concept of interlock.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **either** *(a)* **or** *(b) of each question.*

12. (a) Derive the mathematical model of a first order thermal process.

Or

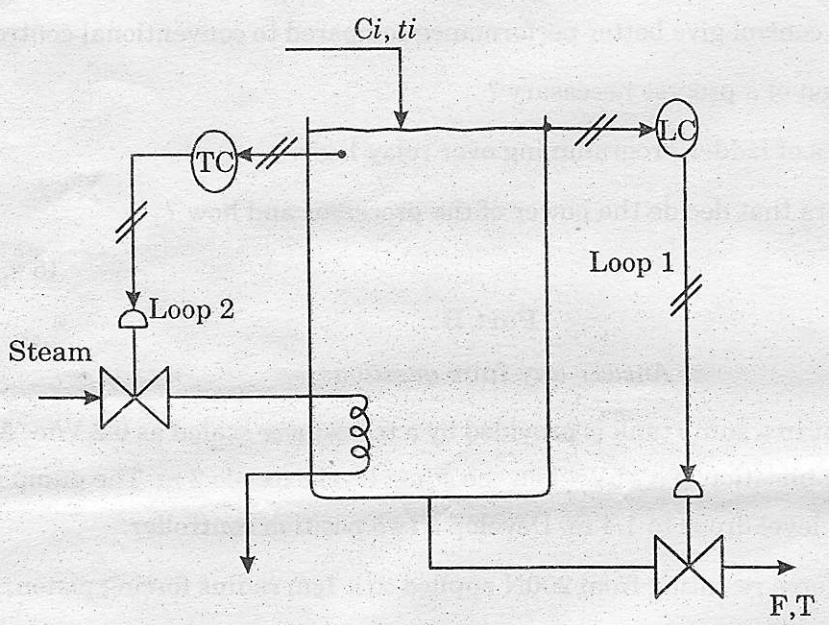
(b) Explain the different types of pneumatic actuators used in process control.

13. (a) Explain the different types of control valves.

Or

(b) With a neat schematic, explain inferential control.

14. (a) Explain the concept of interaction of control loops in a stirred tank heater shown in figure.

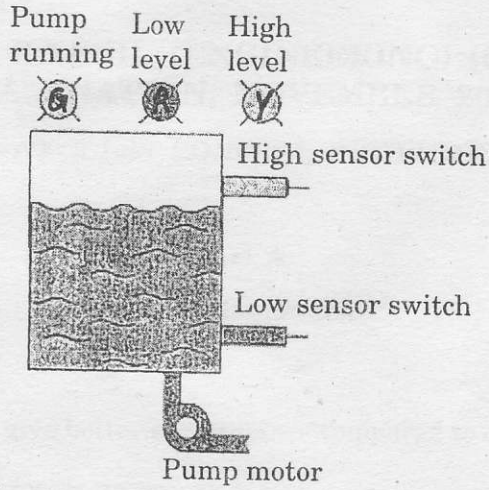


Or

(b) Explain how relative gain array is useful in the selection of control loops.

15. (a) Explain the architecture of PLC with a neat diagram.

(b) Program a ladder to control the level of water in a storage tank.



(4 × 10 = 40 marks)