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Name:	
Roll No. :	To Stand Williamshife Bull Explant
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# 2011 PROCESS CONTROL ENGINEERING

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

### **GROUP - A**

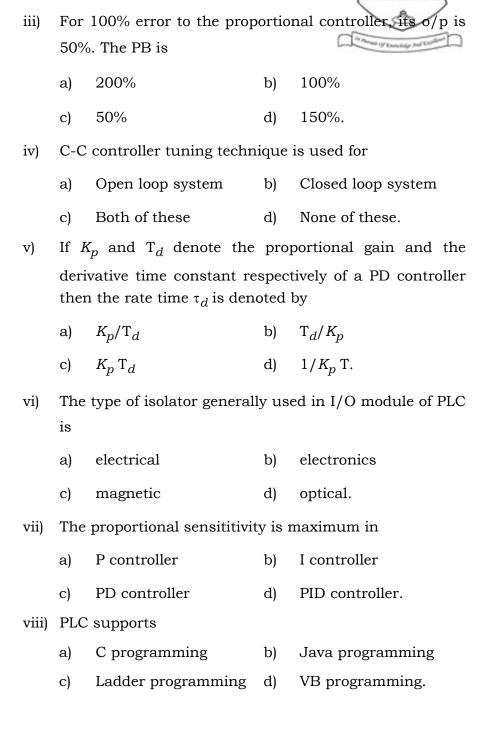
### ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any *ten* of the following:

 $10 \times 1 = 10$ 

- i) The function of reset action in a process controller is to
  - a) reduce rise time
  - b) reduce steady state error
  - c) reduce oscillation in the response
  - d) increase overall gain.
- ii) The basic limitation of *P* action controller only is
  - a) Very slow error correction
  - b) High overshoot
  - c) Non-zero offset
  - d) Instability of process.

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- ix) Which type of networking connectivity is generally supported by DCS?
  - a) LAN

b) MAN

c) WAN

- d) None of these.
- x) An example of an Industrial Control System is
  - a) PLC

- b) DCS
- c) PLC & DCS
- d) None of these.
- xi) DDC is a type of which control scheme?
  - a) Analog control
- b) multi variable
- c) ratio control
- d) feed forward control.

#### GROUP - B

### (Short Answer Type Questions)

Answer any *three* of the following.

 $3 \times 5 = 15$ 

- 2. What is reset action ? Prove that P.B =  $100/K_c$  , where symbols have their usual meaning. 1 + 4
- 3. Explain the ON-OFF controller characteristics without differential gap and with differential gap. Write their advantage and disadvantage. 3 + 2
- 4. What is pneumatic controller? Describe with proper diagram the function of pneumatic relay in a pneumatic controller.

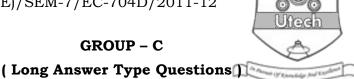
1 + 4

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- 5. What do you mean by "Process Reaction Curve"? How is it obtained for a particular process? How the time constant of a first order process can be determined from the process reaction curve?

  1 + 1 + 3
- 6. What is gateway connectivity in DCS? Describe the generic gateway in DCS. 1 + 4

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## ( Zong imswer Type Questions)

Answer any *three* of the following.

 $3 \times 15 = 45$ 

- 7. What is process resistance and process capacitance? Discuss pneumatic P-I and P-D controller with a schematic diagram. Explain an electronic PD controller and derive its control equation from its circuit diagram. 2 + 8 + 5
- 8. What do you mean by tuning of controller? What are the basic criteria of tuning of controller? Explain the open loop tuning technique of Cohen-Coon. What are the basic criteria of Ziegler-Nichols tuning method? What is <sup>1</sup>/<sub>4</sub> decay ratio?

$$2 + 3 + 5 + 2 + 3$$

9. What is PLC ? What are the advantages of PLC control system ? What are different data files available in PLC ? What is the function of I/O module in a PLC ? Describe the basic functional blocks of a PLC with suitable diagram.

$$2 + 3 + 2 + 3 + 5$$

- 10. What is the necessity of control valve sizing ? What are the factors that should be known for selecting a valve ? A control valve regulates the liquid flow of a tank. The water level is controlled in the tank at a 50 feet by regulating the outflow. The measured inflow varies from 0 to 140 gallons per minute. Calculate  $C_v$  for the valve. What is valve cavitation ? What are the conditions to avoid cavitation ? 2 + 3 + 5 + 2 + 3
- 11. Write short notes on any *three* of the following:  $3 \times 5$ 
  - a) Pneumatic actuator.
  - b) DDC.
  - c) PID controller.
  - d) DCS.
  - e) Boiler drum level control.

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