

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH(EE)/SEM-2/CAM-202/2012**

**2012**

**PROCESS INSTRUMENTATION AND CONTROL**

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.*

Answer any *five* questions.

5 × 14 = 70

1.
  - a) What are the different types of Safe valves used in process industry ?
  - b) Explain with a neat sketch the operation of solenoid and safe valves.
  - c) Discussion Cavitations and Flushing in control valves.
2.
  - a) What do you mean by tuning of a controller ?
  - b) What are the different tuning parameters ?
  - c) Explain 3 C method of open loop tuning.
  - d) In the Ziegler Nichols closed loop tuning method, the critical gain was found to be 4.2, and the critical period was 2.21 min. find the standard setting for PID control.

2 + 4 + 4 + 4

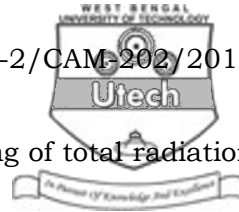
2 + 2 + 5 + 5

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[ Turn over



3. a) What are the different types of Advance control system ?  
b) Explain with diagram the operation of a Multivariable type Controller.  
c) How you can control the disturbance in the safety condition of a liquid level system using Adaptive control ? Discuss. 2 + 6 + 6
4. a) Draw the basic block diagram of a process control loop and explain the blocks in it.  
b) What do you mean by proportional band of a proportional control action ?  
c) What are the different ways to remove the offset of proportional control ?  
d) A process vessel of process capacitance C is pressurized through a valve of process resistance R. Find out the characteristic of the system when (i) source is from constant supply and (ii) supply is from a constant speed pump. 5 + 2 + 3 + 4
5. a) What is force summing device ? What are the different kinds of secondary transducers which convert the output of force summing devices to electrical format ?  
b) Describe an ionization vacuum gauge which is used for measurement of low pressure. 3 + 5 + 6



6. a) Describe the construction and working of total radiation pyrometer.
- b) A platinum thermometer has a resistance of  $100\ \Omega$  at  $25^\circ\text{C}$ .
- i) Find its resistance at  $65^\circ\text{C}$ , if the platinum has a resistance temperature coefficient of  $0.00392/^\circ\text{C}$ .
- ii) At which temperature its resistance is  $150\ \Omega$  ?

8 + 3 + 3

7. a) Starting Bernoulli's theorem obtained an expression for the flow rate of a one dimensional incompressible frictionless fluid flow through a horizontal pipe installed with an orifice meter.
- b) Determine the flow velocity of water of density  $1000\ \text{kg/m}^3$  at the head of a Pitot tube if it produces a pressure differential of  $10\ \text{kPa}$  between the outlets. If the same pressure differential is obtained in air at an altitude where the density of air is  $0.650\ \text{kg/m}^3$ , determine the velocity of air flow.

8 + 3 + 3

8. Write short notes on any *two* of the following :  $2 \times 7 = 14$
- i) Electronic PID controller
- ii) Pneumatic Prop. controller
- iii) Ratio Control in Boiler Furnace.

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