

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (FT)/SEM-6/ET-601/2010  
2010**

**PROCESS INSTRUMENTATION & 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.*

**GROUP – A**

**( Multiple Choice Type Questions )**

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

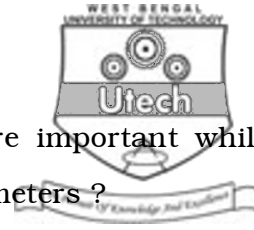
10 × 1 = 10

i) The pressure measured above total vacuum is called

- a) absolute pressure      b) atmospheric pressure  
c) barometric pressure      d) gauge pressure.

ii) A thermistor can be used to control the

- a) Level of water tank      b) Altitude  
c) Temperature      d) All of these.



iii) Which of the following properties are important while selecting alloys for bimetallic thermometers ?

- a) Coefficient of expansion
- b) Electrical conductivity
- c) Modulus of elasticity
- d) All of these.

iv) Flow of liquid or gas in a pipeline is

- a) Proportional to pressure in the pipeline
- b) Proportional to differential pressure across the restriction introduced in pipeline
- c) Inversely proportional to square root of differential pressure across restriction in pipeline
- d) Proportional to square root of differential pressure across the restriction in pipeline.

v) The effect of feedback on the plant is

- a) to make the plant simple
- b) to reduce the sensitivity to plant parameter variations
- c) to control system transient response
- d) both (b) and (d).



- vi) The knowledge of transfer function of a system is necessary for calculation of
- a) The time constant
  - b) The order of the system
  - c) The output for any given input
  - d) The steady state gain.
- vii) A system is called absolutely stable if any oscillations set up in the system are
- a) Self sustaining & tend to last indefinitely
  - b) Eventually damped out
  - c) Not enough to change the parameters of the system
  - d) None of these.
- viii) Load cells are devices that convert
- a) force into pressure      b) force into current
  - c) force into voltage      d) force into acceleration.
- ix) Thermocouples can be used to measure the temperature up to
- a) 1600° C      b) 1200° C
  - c) 500° C      d) 150° C.



- x) The number of root-locus segments which do not terminate on zeros is equal to
- a) the number of poles
  - b) the number of zeros
  - c) the difference between the number of poles and the number of zeros
  - d) the sum of the number of poles and the number of zeros.
- xi) The transfer function  $G(s) = \frac{50}{s(s^2 + 4s + 12)}$  indicates that the system will be
- a) stable
  - b) unstable
  - c) conditionally stable
  - d) none of these.
- xii) The presence of  $\text{CO}_2$  in the intervening space of radiation pyrometers will
- a) affect the reading of pyrometer
  - b) not affect the reading of pyrometer
  - c) make pyrometer read more than desired value of temperature
  - d) increase the sensitivity of pyrometer.



**GROUP – B**  
**( Short Answer Type Questions )**

Answer any *three* of the following.

$3 \times 5 = 15$

2. What are load cells ? Describe the operation of any load cell.

1 + 4

3. Find the transfer function of the circuit given.

**Fig.**

4. Explain the principle of operation of infrared transmission measurement of moisture.
5. Discuss the advantages and disadvantages of closed loop control system.
6. What is transient and steady state response ? Define the following term domain indices of a control system :

- i) Rise time
- ii) Settling time
- iii) Peak overshoot.

2 + 3



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

3 × 15 = 45

7. Sketch the root locus of the system mentioning all the steps.

$$G(s) H(s) = \frac{K}{s(s+1)(s+6)}.$$

8. Distinguish between the following :

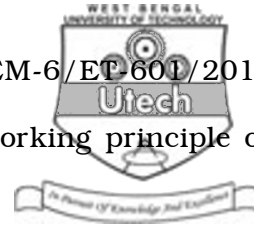
- i) Thermistors and thermocouples
- ii) Radiation pyrometer and optical pyrometer.

9. a) Find the overall transfer function of the system shown below.

**Fig.**

- b) The open loop transfer function of a unity feedback control system is given by  $G(s) = \frac{K(s+1)}{s(s+4)(s+5)}.$

Discuss the stability of the closed loop system as a function of  $K$ .



10. a) Explain with relevant diagram the working principle of an electromagnetic flowmeter. 7 + 8
- b) How are springs used in balances ? Describe how the capacity may be enhanced in spring balances. 7 + 8
11. Write short notes on any *three* of the following : 3 × 5
- a) Strain gauge
  - b) Modulation
  - c) Final control element
  - d) Response of a control system.
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