	Utech
Name:	
Roll No.:	To place of Samulage and Explana
Invigilator's Signature :	

#### 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.

#### **GROUP - A**

## ( Multiple Choice Type Questions )

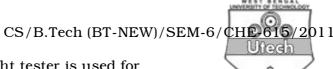
 $1. \quad \hbox{Choose the correct alternatives for any $\it ten$ of the following:}$ 

 $10 \times 1 = 10$ 

- i) Which of the following controllers has the best maximum deviation?
  - a) *P*-controller
- b) PI-controller
- c) *PID*-controller
- d) PD-controller.
- ii) Bourdon gauges are used for measuring pressure
  - a) < atmospheric
- b)  $> 2kg/cm^2$  gauge
- c)  $< 2kg/cm^2$  gauge
- d)  $> 10 \text{kg/cm}^2$ .

6424 [ Turn over

iii)		ch of the following j	udges	s the accuracy of an
	a)	Dead zone	b)	Drift
	c)	Static error	d)	None of these.
iv)	Whi	ch is the most suitable	instr	rument for measuring a
	temperature of 2000° C ?			
	a)	Mercury thermometer		
	b)	Radiation pyrometer		
	c)	Bimetallic thermomete	r	
	d)	None of these.		
v)		is a desiral	ole s	static characteristic of
	instruments.			
	a)	Drift	b)	Dead zone
	c)	Static error	d)	Reproducibility.
vi)	Whi	ch of the following is	not	a mechanical pressure
	sens	sing element ?		
	a)	Bellows	b)	Diaphragm
	c)	Bourdon tube	d)	<i>U</i> -tube.



- vii) Dead weight tester is used for
  - a) testing dead weight
  - b) measuring the process pressure accuracy
  - c) producing the high pressure
  - d) calibrating the pressure instruments.
- viii) One tor is defined as
  - a) one mm Hg
- b) one inch Hg
- c) one atmosphere
- d) one kilopascal.
- ix) Bode diagram is a plot of
  - a)  $\log (AR) vs f$
- b)  $\log \phi vs f$
- c) AR vs log(f)
- d)  $\phi$  vs log (f).
- x) Bode stability method uses ...... loop transfer function.
  - a) open

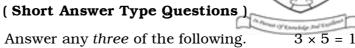
- b) close
- c) either (a) or (b)
- d) none of these.
- xi) Phase margin is equal to
  - a) 180 phase lag
- b) phase lag 180
- c) phase lag + 180
- d) phase lag + 90.
- xii) Critically damped system means damping coefficient is
  - a) 1

b) < 1

c) > 1

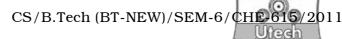
d) 0.

# GROUP – B (Short Answer Type Questions)



- 2. a) State the advantages of electronic instrumentation system.
  - b) Draw the block diagram of electronic instrumentation system. Briefly state the function of each block.
- 3. Draw the circuit diagrams of
  - a) digital to analog controller
  - b) current to pressure converter.
- 4. Define overshoot and decay ratio, time constant with their expressions.
- 5. What do you mean by process reaction curve? Give a brief comparison between feedback and feed forward control. 3+2
- 6. Describe a method for measurement of vacuum pressure.

6424 4

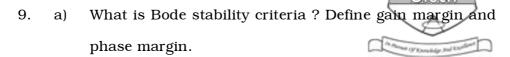


#### **GROUP - C**

## (Long Answer Type Questions)

Answer any *three* of the following.

- 7. a) Describe three desirable and three non-desirable static characteristics of an instrument measuring any process parameter.
  - b) What is Doppler meter ? Mention its application and limitation.
- 8. a) Derive the transfer functions of proportional ( *P* ), proportional plus integral ( *PI* ), proportional plus derivative ( *PD* ) and proportional plus integral plus derivative ( *PID* ) control actions and explain the terms used therein. Differentiate between the actions of *P*, *PI* and *PID* controllers.
  - b) Draw the block diagram of a control system illustrating a cascade control loop. Explain its purpose. 9 + 6



- b) What is controller tuning?
- c) What are the different methods of tuning of controller?
- d) In the Ziegler-Nichols tuning method, the critical gain was found  $4\cdot 2$  and the critical period was  $2\cdot 21$  minute. Find the standard setting of PID controller.

2 + 3 + 2 + 2 + 6

- 10. a) Define any four of the following:  $4 \times 2$ 
  - i) Resolution
  - ii) Sensitivity
  - iii) Dead band
  - iv) Drift
  - v) Hysteresis
  - vi) Accuracy
  - vii) Precision
  - viii) Transducer.
- b) Compare the function of LVDT and RVDT.6



11. Write short notes on any three of the following: 3

a) Cascade control

- b) Principle of operation of recording instrument
- c) Characteristic curve of a control valve
- d) Dynamic characteristics of instruments
- e) ON-OFF control.

6424 7 [ Turn over