

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V • EXAMINATION – WINTER 2013

Subject Code: 153501

Date: 27-11-2013

Subject Name: Process Instrumentation, Dynamics and Control

Time: 10.30 am - 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** I. What are the configurations of control system? **04**
 II. Write a short note on classification of process variable. **03**
(b) Derive the transfer function for mercury thermometer. List out the assumptions and justify them. **07**

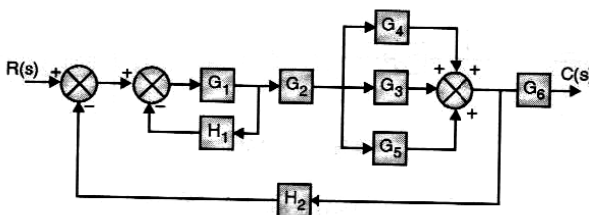
- Q.2 (a)** I. Define: a. Transfer function b. Process Dynamics c. Time constant **03**
 II. Explain dynamic characteristics for instruments. **04**
(b) A thermometer with time constant 7 seconds and showing steady state temperature 27°C suddenly immersed in an oil bath at 160°C. Find: **07**
 (i) Temperature reading on thermometer after 7sec?
 (ii) Time required for temperature reading of 100C?

OR

- (b)** What is second order system? Explain the various terms used to describe an underdamped second order response. **07**
- Q.3 (a)** Define 'Stability' and find the stability of the system using Routh stability criterion having characteristic equation; $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$ **07**
(b) Derive overall transfer function for two tanks connected in series Interacting system. **07**

OR

- Q.3 (a)** What is the transfer function of PID controller? Also explain selection criteria for controllers. **07**
(b) Explain DCS in detail with neat figure showing typical module connections. **07**
- Q.4 (a)** Find the single block equivalent by block diagram reduction for following example; **07**



- (b)** Explain the construction of pneumatic control valve. Also explain valve sizing. **07**
- OR**
- Q.4 (a)** What are the basic functions of process instruments? Also write a short note on Transducers. **07**
(b) What are Bode diagrams? Explain the graphical rules for Bode diagrams. **07**
- Q.5 (a)** List out various level measuring instrument and discuss level measurement in pressure vessels. **07**
(b) Explain absolute/vacuum pressure measuring instruments in detail. **07**

OR

- Q.5 (a)** Classify flow measuring instruments. Also explain the methodology for determination of flow rate with equation for venturi meter. **07**
- (b)** Mention various temperature measurement devices and explain the temperature measurement by thermocouple. **07**
