

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER • 2014****Subject Code: 153501****Date: 11-06-2014****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)** Derive transfer function for a system mercury-in-glass thermometer. What is the significance of time constant? **07**
- (b)** Define the following terms: **07**
- (i) overshoot
 - (ii) decay ratio
 - (iii) response time
 - (iv) proportional band
 - (v) rise time
 - (vi) time constant
 - (vii) Transfer Function
- Q.2 (a)** Define 'Stability' and find the stability of the system using Routh stability criterion having characteristic equation: $S^4 + 4S^3 + 6S^2 + 20S + 15 = 0$ **07**
- (b)** Differentiate between positive feedback and negative feedback system. **07**
- OR**
- (b)** Derive overall transfer function for two tanks connected in series Non-interacting system. **07**
- Q.3 (a)** What is process dynamics? Write a short note on dynamic characteristics of instrument. **07**
- (b)** Write a short note on servo problem vs Regulator problem **07**
- OR**
- Q.3 (a)** What do you mean by open loop transfer function and closed loop transfer function? Determine the transfer function $Y(s) / X(s)$ for the following block diagram. **07**
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- (b)** List out different types of controllers and derive transfer function equation for P-type of controller **07**
- Q.4 (a)** What are the applications of root locus? Also obtain root locus for a unity feedback system with $G(s) = \frac{k}{s}$ and $H(s) = 1$. **07**
- (b)** Write a short note on DCS with neat figure showing its typical module connections **07**
- OR**
- Q.4 (a)** Explain Valve sizing and determine the maximum flow through the valve for a pressure drop of 100 psi with a valve of Cv rating 4.0 used to throttle the flow of glycerin for which $G = 1.26$. **07**
- (b)** Write a short note on Transducers and list out the components of control system **07**

- Q.5 (a)** Describe the principle, construction and working of thermocouple used for temperature measurement. **07**
- (b)** What is thermal well? Why is it used? How thermal well affect the dynamic response of the thermometer? **07**
- OR**
- Q.5 (a)** Classify flow measuring instrument. Also explain the methodology for determination of flow rate with equation for venturi meter. **07**
- (b)** Write a short note on Pirani gauge and ionization gauge **07**
