## GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V EXAMINATION – WINTER 2015

## Subject Code: 153501 Date:15/12/2015 Subject Name: Process Instrumentation, Dynamics and Control **Time: 10:30am to 1:00pm Total Marks: 70 Instructions:** 1. Attempt all questions. Make suitable assumptions wherever necessary. 2. Figures to the right indicate full marks. 3. Q.1 Derive transfer function for mercury-in-glass thermometer. List out the 07 (a) assumptions made. Explain the terms: overshoot, decay ratio, rise time, response time, period of (b) 07 oscillation & natural period of oscillation A proportional controller having gain K<sub>C</sub> is used to control two non-Q.2 07 (a) interactingliquid level tanks having time constants $\tau_1 = 1$ and $\tau_2 = 0.5$ , for the unityfeedback control system. Determine the stability of the system using Routhcriterion (b) Determine the linearized transfer function for liquid level system with non-07 linearresistance. OR Derive the transfer function of interacting system 07 (b) Q.3 A thermometer with time constant 7 sec showing a steady temperature of 30 07 (a) °C is suddenly immersed in heated oil bath at 150 °C. Find (i) Time required for temperature reading of 100 °C. (ii) Time required for the 80 % response What are the various components of a control system? Explain positive and (b) 07 negative feedback system. OR Q.3 (a) A thermometer with time constant 10 sec showing a steady temperature of 35 07 °C is suddenly immersed in heated oil bath at 200 °C. Find (i) Time required for temperature reading of 150 °C. (ii) Temperature reading on the thermometer after 25 sec. (iii) The percentage response after 40 sec. List out different types of controllers and derive transfer function equation 07 (b) for PID controller Q.4 Derive transfer function of liquid level system with constant outlet. 07 (a) What are Bode diagrams? Explain the graphical rules for Bode diagrams. (b) 07 OR Derive transfer function of a mercury manometer. Q.4 (a) 07 With a neat figure explain the construction and working of Pneumatic 07 (b) Control Valve? Q.5 (a) Explain working and construction of pressure spring thermometers. 07 Give detailed classification of measuring instruments (b) 07 OR Q.5 (a) Explain principle, construction and working of orifice meter. 07 07 What are static characteristics of instrument? Explain them in detail. (b)

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