Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER • 2014

Subject Code: 150504 Date: 01-12-2014

Subject Name: Instrumentation and Process 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)** Solve $\frac{dx}{dt} + 2x = 4.5$ using Laplace transform, subject to initial condition x(0)=4. **07**

(b) With suitable example describe the hardware elements of control system. **07**

Q.2 **(a)** What is first order system? Describe dynamic response of first order lag system to unit step change. **07**

(b) Response of non interacting capacities never results in an underdamped system. True or False? Explain. **07**

OR

(b) Describe the overdamped, critically damped and underdamped responses of a second order system. **07**

Q.3 **(a)** Compare different types of feedback controllers. Explain PI controller in detail. **07**

(b) Briefly describe servo and regulator problem. Obtain the transfer function C(s)/R(s) for the block diagram shown in figure 1. **07**

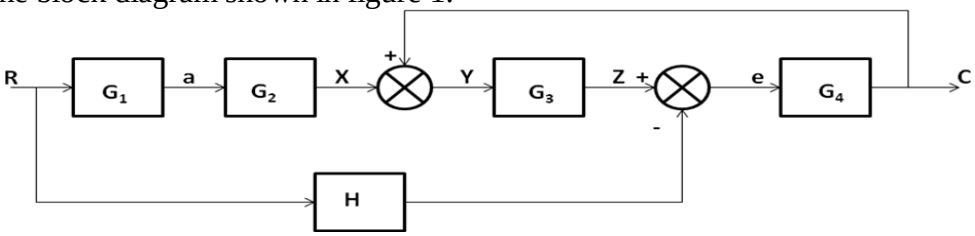

Figure 1: Block diagram to be reduced

OR

Q.3 **(a)** Discuss the effect of K_c, τ_I and τ_D on close loop response of process controlled with PID controller. **07**

(b) Explain Nyquist stability criteria. **07**

Q.4 **(a)** Describe Bode diagram for first order system. **07**

(b) Describe the pneumatic control mechanism of PI controller. **07**

OR

Q.4 **(a)** Describe control valve characteristics. **07**

(b) Derive the transfer function for U tube manometer system. **07**

Q.5 **(a)** Describe the bubbler system for liquid level measurement. **07**

(b) Explain the principle, construction and working of rotameter. **07**

OR

Q.5 **(a)** Describe radiation pyrometer. **07**

(b) List pressure measuring instruments. Explain any one in detail. **07**

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