



DGG-003-0011402 Seat No. \_\_\_\_\_

M. Sc. (Sem. IV) (CBCS) Examination

April / May – 2015

IC - 402 : Process Control & Dynamics

Faculty Code : 003

Subject Code : 0011402

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

**Instructions:**

- 1) All Questions are compulsory.
- 2) Each question carries 14 marks.
- 3) Assume suitable data wherever necessary.

**Q1] Answer any seven out of the following:**

- 1) Explain the term Laplace transform.
- 2) Find Laplace transform of  $\frac{dx}{dt} + x = 1$ . Given  $x(0) = 0$ .
- 3) Explain in brief PI-control.
- 4) Define the term Input signal and hunting.
- 5) Enlist various components of a control system.
- 6) Give advantages of manual control system.
- 7) What is meant by ON-OFF control?
- 8) What do you mean by offset and range?
- 9) Draw a labeled diagram of control valve.
- 10) Explain the term transfer function.

**Q2] Answer any two from the following:**

- 1) Derive an equation for control over a mixing system without chemical reaction.
- 2) Derive an equation for step change given to a mixing system without chemical reaction.
- 3) Explain with neat diagram automatic temperature control system in a heater with a neat diagram.

**Q3] Answer the following:**

- 1) Derive an equation for first order thermometer system with a mercury bulb.
- 2) Derive an equation for interacting system.

**OR**

**Q3] Answer the following:**

- 1) Explain difference between open loop control system and closed loop control system.
- 2) What do you mean by the term transportation lag? Explain reason for transportation lag with diagram.

**Q4] Answer any two from the following:**

- 1) Derive an equation for non-interacting system.
- 2) Find Laplace transform of  $f(t) = \sin t$ .
- 3) Derive an equation for ramp change given to a thermometer system.

**Q5] Answer any two from the following:**

- 1) Derive an equation for control over liquid level of single inlet and two outlets.
  - 2) Derive an equation for step change given to a thermometer system.
  - 3) Derive an equation for first order liquid level controller system having single inlet and single outlet.
  - 4) Consider a thermometer kept in a ice bath at temperature 273K and time constant for a system is 1min is given a step change of 300K. Calculate the thermometer reading after 2min, 3min, 4min, 5min, and 6min.
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