



NBU-003-011402 Seat No. _____

**M. Sc. (Industrial Chemistry) (Sem. IV) (CBCS)
Examination**

April / May - 2017

IC - 402 : Process Control & Dynamics

Faculty Code : 003

Subject Code : 011402

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.

1 Answer any **seven** out of the following ten questions : **14**

- (1) Enlist any two advantages and disadvantages of manual control system
- (2) Write a short note on linearity of a valve?
- (3) What do you mean by the term Laplace Transform?
- (4) Explain ON-OFF control system?
- (5) Define the term input signal and output signal.
- (6) Draw a neat diagram of an automatic control valve with labelling.
- (7) What do you mean by Offset?
- (8) What is unsteady state control system?
- (9) Write a mathematical equation for PI-control and PD-control.
- (10) Define :
 - (a) Range
 - (b) Hunting.

- 2 Answer any **two** from the following three questions : 14
- (1) Derive an equation for non-interacting system.
 - (2) A thermometer is kept in an ice bath at 273 K temperature is given a step change by putting it in a water bath maintained at 283 K temperature. Given the time constant for the thermometer system is 1 minute. Calculate the thermometer reading after 1 min, 2 min, 3 min, 4 min, 5 min, 6 min and 7 min.
 - (3) Compare open loop control system and closed loop control system.
- 3 Answer the following : 14
- (1) Explain with a neat diagram construction and working of Automatic heating control system.
 - (2) Explain working of an automatic control valve in heat exchanger with a neat diagram.
- OR**
- 3 Answer the following : 14
- (1) Find Laplace Transform of $f(t)=\cos t$.
 - (2) Find Laplace Transform of $f(t)=\sin t$.
- 4 Answer any **two** from the following three questions : 14
- (1) Derive an equation for step change given to mixing system without chemical reaction.
 - (2) Derive an equation for step change given to mixing system with chemical reaction.
 - (3) Write a short note on positive feedback control system and negative feedback control system.
- 5 Answer any two **from** the following four questions : 14
- (1) Derive Laplace Transform of liquid level controller for 1s' order system single inlet and two outlet (SITO) tank.
 - (2) Derive an equation for interacting system.
 - (3) Derive Laplace Transform for exponential change given to 1s' order thermometer system.
 - (4) What do you mean by Transportation lag? Explain reasons for transportation lag with diagram.