B.TECH. SEM -VII (CHEMICAL 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT : PROCESS DYNAMICS AND CONTROL

Day **Friday** Time **02.30 PM TO 05.30 PM**

Date **19/01/2018** **W-2017-2256** Max. Marks : 60

N. B. :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable calculator is **ALLOWED**.
4) Assume suitable data if necessary.

Q. 1 Discuss the effect of PI controller on first order system. **(10)**

OR

Discuss the effect of 'P' controller on first order system. **(10)**

Q. 2 Consider a second order system with the following transfer function: **(10)**

$$G(s) = \frac{y(s)}{m(s)} = \frac{1}{s^2+s+1}$$

Introduce a step change of magnitude '4' into a system.

Find :

a) Percent overshoot
b) Maximum value of y (t)
c) Period of oscillation
d) Rise time
e) Decay Ratio

OR

Identify the three classes of second order systems give one representative example of each class. What is the origin of the most 2nd order systems in chemical processes? **(10)**

Q. 3 Describe servo mechanism control problem for proportional integral controller. **(10)**

OR

A proportional controller is used for two first order system. The time constant for system are 1 and 0.5. The value of steady state gain of controller 5. Consider the unity feedback control system. The set point of control system is given step change of magnitude 0.5. **(10)**

Determine off set for the following system:

$$G_p = \frac{1}{(s+1)(0.5s+1)}$$

$$G_c = K_c$$

P. T. O.

Q. 4 Sketch the root locus diagram for following equation: **(10)**

$$1 + \frac{k_c}{s\,(s+1)\,(2s+1)} = 0.$$

OR

a) Give limitations of the Routh Hurwitz test for stability. **(03)**

b) By means of Routh test, determine the stability of the following system: **(07)**

$$G_p = 2$$

$$G_c = kc\,(1 + 3/s)$$

$$G_f = 1$$

$$G_m = \frac{1}{0.2s^2 + 0.4s + 1}$$

Q. 5 Plot Bode diagram for closed loop control system **(10)**

$$G_c = 4(1 + 2s)$$

$$G_p = \frac{1}{(s+1)\,(0.2\,s+1)}$$

$$G_m = e^{-s/2}$$

$$G_f = 1$$

OR

What are Bode and Nyquist stability criteria? Explain procedure for finding stability by both methods. **(10)**

Q. 6 Write short note on: **(10)**

a) Feed forward control

b) Ratio Control

OR

Explain cascade control system with example. **(10)**

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