

Total No. of Questions : 10]

SEAT No. :

P4514

[Total No. of Pages : 2

[4959]-1171

B.E. (Chemical) (Semester - I)
PROCESS DYNAMICS & CONTROL
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3, or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Derive transfer function of single tank liquid level system and obtain time-domain equation for the process if input is given a step change. [6]
b) Develop the transfer functions of two non-interacting tanks placed in series. [4]

OR

- Q2)** a) What are the relative advantages and disadvantages of the proportional, integral and derivative control action? [5]
b) Discuss the effect of Proportional controller on the response of a controlled process given $G_m(S) = 1$, $G_f(S) = 1$, $G_p(S) = 1/(\tau_p S - 1)$. [5]

- Q3)** a) Explain Cohen-Coon technique of controller tuning using process reaction curve. [5]
b) The characteristics equation for a control system is [5]
$$s^4 + 4s^3 - 6s^2 + 4s + (1 + K) = 0$$

Lising Routh test (i) Determine the value of K above which the system is unstable. (ii) Determine the value of K for which two of the roots are on the imaginary axis and determine the values of these imaginary roots.

- Q4)** Sketch the root locus for the following transfer function. [10]

$$G(s) = \frac{K}{s^2(s^2 + 2s + 2)}$$

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- Q5) a)** Sketch the Nyquist diagram for P1 controller. [8]
b) Sketch the Bode plot for an open loop transfer function with the following dynamic components. [10]

$$G_p(s) = \frac{1}{s+1} \quad G_m(s) = \frac{0.95}{0.01s+1} \quad G_c(s) = 10 \quad G_f(s) = 1$$

OR

- Q6) a)** Explain Ziegler - Nichols tuning technique. [6]
b) Using Bode stability criterion, find whether the following open loop transfer function is stable. [12]

$$G_{OL} = \frac{10e^{-3s}}{4s+1}$$

- Q7) a)** What are the relative advantages and disadvantages of feed forward and feedback control action? [8]
b) Explain ratio control with a neat sketch. [8]

OR

- Q8)** Discuss in detail with a neat sketch of the following : [16]
a) Cascade control system for distillation columns.
b) Split range control of the pressure in steam header.

- Q9) a)** Write a short note on [8]
i) PLC & DCS
ii) Role of digital computers in process control
b) Explain sampling of continuous signals to discrete time signals. [8]

OR

- Q10)** What is plant wide control? Explain with suitable example. [16]

