

B.Tech. (Biotechnology) Sixth Semester (C.B.S.)
Process Control in Biotechnology Paper - IV

P. Pages : 2

Time : Three Hours

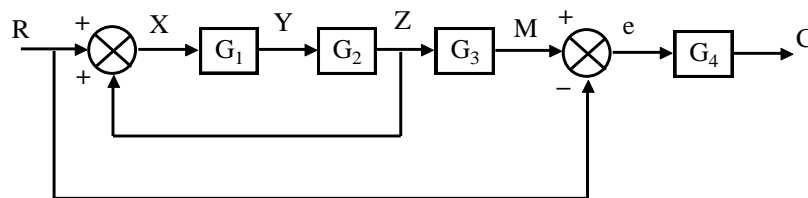


TKN/KS/16/7957

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Answer **any five** questions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Derive the transfer function for liquid level 'h' for a single tank system having cross sectional area 'A' m² flow rate at the outlet is controlled by resistance valve. **8**
b) A manometer 10 cm long and 6mm inner diameter glass tube is half filled with water. This manometer is given a step change of pressure difference of 500 N/m² Determine.
i) Time constant. **8**
ii) Damping constant the density of water 1000 kg/m³, Viscosity of water 1000 dec/m².
2. a) Determine the transfer function $\frac{Q_3(s)}{Q(s)}$ for the liquid level. When three tank connected in Non-interacting system for second control system. **10**
b) Explain in details linearization in process Dynamics. **6**
3. a) Determine the overall transfer function relating the controlled variable with set point for constant value of load variable. **8**
b) Determine the overall transfer function $\frac{C(s)}{R(s)}$ for system shown in fig. **8**



4. a) Explain the mechanism, working principle of the proportional Integral derivative controller. Also derive the transfer function of it. **10**
b) Explain the methods of plotting the Root-Locus diagram for negative feedback system. **6**
5. a) A Proportional derivative controller having the gain K_C and the derivative time is 4, is used to controller two first system having time constant $Z_1 = 1$ and $Z_2 = 0.5$. If the gain of the process is 0.5 sketch the root-locus diagram for the control system. The transfer function of measuring element is $1/s$. **10**

- b) A PD controller having the derivative time $Z_D = 4$ use to control the two non-interacting first order system having time constant $Z_1 = 1$ & $Z_2 = 0.5$. The gain of the system is 0.5. Determine the stability of control system. Use Routh criterion. Assume unity feedback control system. **6**
- 6.** The open loop transfer function of control system is given as, $G(s) = \frac{K_C S}{(S+1)(0.1S+1)}$ **16**
Sketch the asymptotic Bode diagram for control system.
- 7.** a) Explain in detail principle, working, mechanism and construction of electrical sensor used for temperature measurement. **8**
- b) Write in detail about level measurement method based on buoyancy effect. **8**
- 8.** a) Write short note on: **8**
i) Application of composition analysis in manufacturing industry.
ii) Importance of pressure measurement and control in various process.
- b) Discuss in detail the flow measurement and flow measuring instrument with their principle, construction, and working. **8**
