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Total number of printed pages – 2

B. Tech
PCCH 4304

Sixth Semester (Special /Back) Examination – 2013

PROCESS DYNAMICS AND CONTROL

BRANCH : CHEM

QUESTION CODE : E 287

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.*

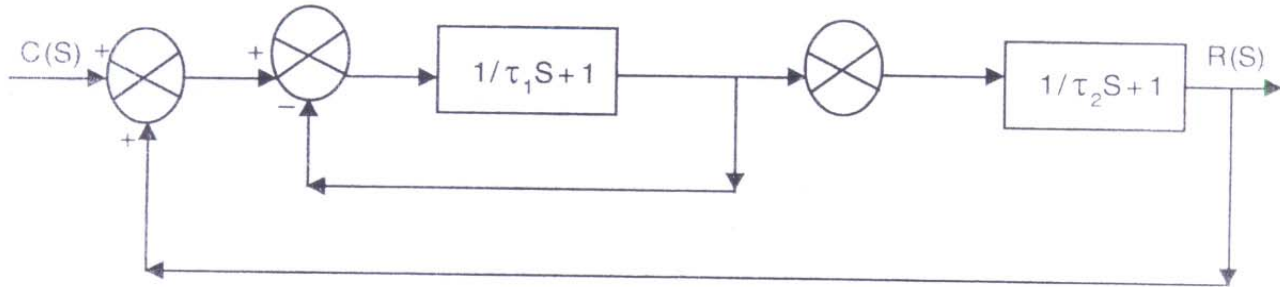
1. Answer the following questions : 2×10
- (a) What is the significance of a transfer function ?
 - (b) What is transportation lag ?
 - (c) Write the objectives of a controller.
 - (d) Write the characteristics of a first order system.
 - (e) Define response time and rise time.
 - (f) Write the location of the roots for over damped, under-damped, and critical damped systems.
 - (g) What is the Bode stability criterion ?
 - (h) Differentiate between feedback and feed-forward controller.
 - (i) What is the transfer function of a PID controller ?
 - (j) What is a ratio controller ?
2. (a) Derive an expression for the transient response of first order system when a ramp step input is introduced. 8
- (b) What is transient response of a system ? 2



P.T.O.

3. Find $C(s)/R(S)$ for the following :

10



4. (a) A proportional derivative controller is used for control of first order system having time constant 8 second. The controller gain is 30 and the derivative time constant is 9 second. The control system has a measuring element (1st order) of time constant 5 sec and gain of 3. If the step magnitude of 0.16 is given to the load variable determine the offset. 8
- (b) Differentiate between servo and regulatory problems. 2
5. Explain the steps followed to determine the stability of a feedback control system using Routh-Hurwitz method. 10
6. Prove that U-tube manometer is a second order instrument. 10
7. A control system having transfer function is expressed as :

$$G(S) = 8/(2s^2 + 8s + 10)$$

The control system is subjected to a step change of magnitude 5. Calculate : 10

- (a) the value of $Y(t)$ at $t = 1$ min,
- (b) Ultimate response,
- (c) Overshoot,
- (d) Decay ratio, and
- (e) Maximum value of $Y(t)$.
8. Write short notes on any **two** : 5×2
- (a) Pneumatic Valve
- (b) Sampling
- (c) Cascade controller
- (d) Frequency response analysis of a first order system.

