Registration No : | | | | | | | | | | |

Total number of pages : 02 **B.Tech.**

PCCH4304

6th Semester Back Examination 2017-18

PROCESS DYNAMICS AND CONTROL

BRANCH : CHEM

Time : 3 Hours

Max Marks : 70

Q.CODE : C208

Answer Question No. 1 which is compulsory and any FIVE from the rest.

The figures in the right-hand margin indicate marks.

Assume suitable notations and any missing data wherever necessary.

Answer all parts of a question at a place.

Q1. **Answer the following questions :** **(2 x 10)**

(a) Classify the different types of variables in a control system.

(b) What do you mean by inferential control scheme?

(c) Differentiate between positive feedback and negative feedback control system.

(d) Write the transfer function of PID controller.

(e) A system has the transfer function given by:

$$\frac{Y(s)}{X(s)} = \frac{10}{s^2 + 1.6s + 4}$$

If a step change of 4 units magnitude is introduced into this system, then calculate its percent overshoot.

(f) Differentiate between phase margin and gain margin.

(g) State the Routh array stability criterion.

(h) Differentiate between servo and regulator control problem.

(i) Define offset. What is the offset value for PI controller?

(j) Which controller is known as the rate controller?

Q2. Discuss the different parts of a complete control system. **(10)**

Q3. Define transfer function. Derive the transfer function of mercury in glass thermometer with suitable notations and assumptions. **(10)**

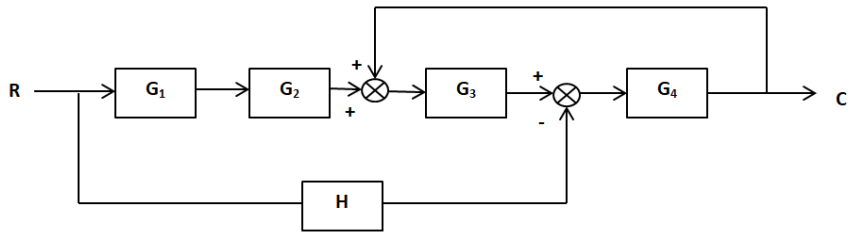
Q4. A mercury thermometer having a time constant of 0.1 min is placed in a temperature bath at 100°F and allowed to come to equilibrium with the bath. At time t=0, the temperature of the bath begins to vary sinusoidally about its average temperature of 100°F with an amplitude of 2°F. If the frequency of oscillation is 10/π cycles/min, plot the ultimate response of the thermometer reading as a function of time. What is the phase lag? **(10)**

Q5. Plot the Bode diagram for the system whose overall transfer function is **(10)**

$$G(s)=\frac{1}{(s+1)(s+5)}$$

Q6. Write the procedure for drawing the Root locus plot. **(10)**

Q7. Determine the overall transfer function $C(s)/R(s)$ for the following system. **(10)**



Q8. **Write short notes on any TWO :** **(5 x 2)**

(a) C-C controller tuning
(b) Cascade control system
(c) Transfer function of a mixing process
(d) Procedure for Bode plot