Comprehensive Examination (CLOSE BOOK)   **Duration: 3 h**

Date: 26/12/2012   **Max. Marks: 40 Min**
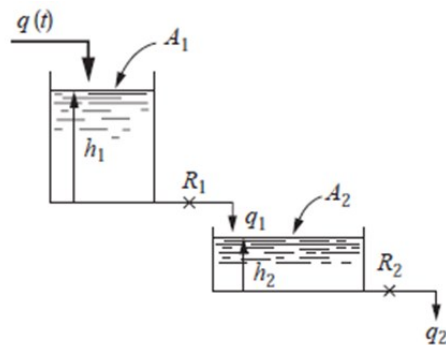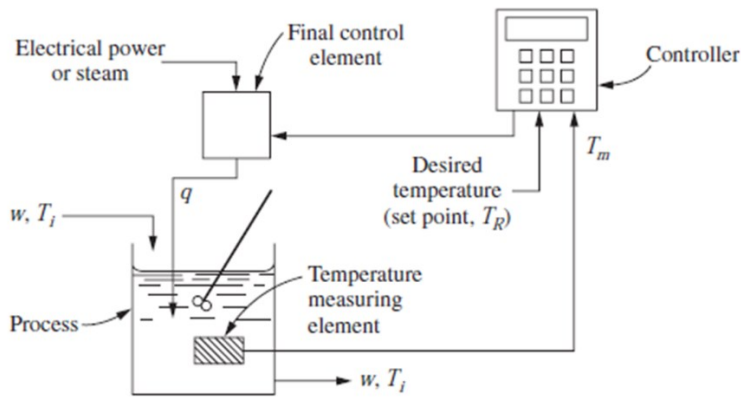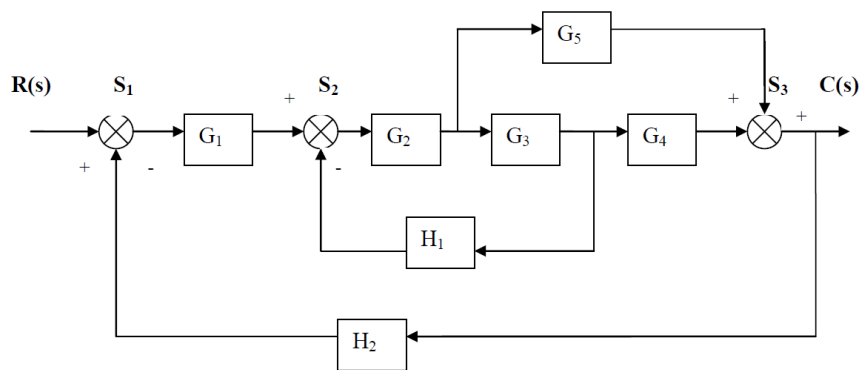
1. Find the inverse transform of $G(s) = \dfrac{1+ e^{-2s}}{(4s+1)(3s+1)}$ [6 x 5= 30 M]

2. Derive the transfer function for two non-interacting tanks in series is shown in Fig. Show the tank-1 and tank-2 responses for a unit step change in q(t) with a neat sketch.

3. Develop the closed-loop transfer function for the system shown in Fig.

4. Find C(s)/R(s) for the system shown in Fig.

5. Plot the root locus diagram $G(s) = \dfrac{s+4}{s^2+2s+5}$

6. Draw the bode diagram for a closed loop transfer function is given by $G(s) = \dfrac{e^{-10s}}{(s+1)(s+5)}$

7. Answer the following   [10 M]

   a. Define time constant for a 1st order system

   b. Define Rise time, Decay ratio

   c. Self-regulation system

   d. Transportation lag

   e. Draw the schematic for air-to-open & Air-to-close

   f. Inverse response system

   g. Servo and Regulatory mechanism

   h. Transfer functions for P, PI, and PID controllers

   i. Importance of the Routh test

   j. PID parameters using ZN settings