Library

B.E. (Elect.) VII (REV) 30/5/08
Control System II

ws April 06 52

Con. 3249–08. (REVISED COURSE) CO–3352

(3 Hours) [Total Marks : 100

MASTER

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data wherever **required**.
(4) **Figures** to the **right** indicate **full** marks.

1. Attempt any **four** :–
   (a) Describe the design specifications for 5
   (i) Transient Response (ii) Frequency Response.
   (b) Write short notes on transient response design via gain adjustment. 5
   (c) Describe advantages of state space design techniques over classical design techniques. 5
   (d) Derive transfer function from state space equation for single input single output system. 5
   (e) Write short notes on : 5
   (i) Systematic effects (ii) Asynchronous sampling.

2. Given a unity feedback system with 20

$$G(s) = \frac{k(s+8)}{(s+3)(s+6)(s+10)}$$

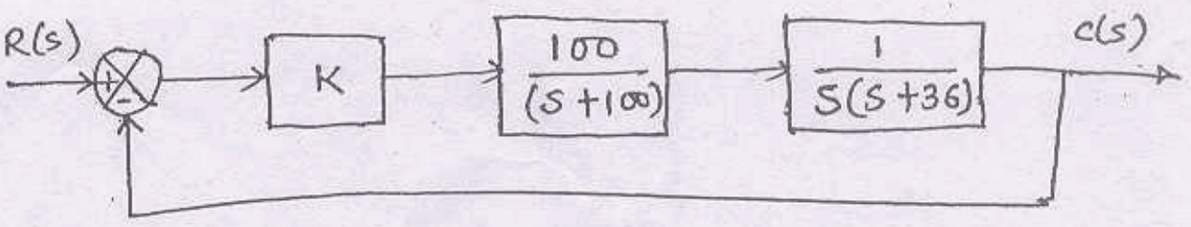
Design a PID controller so that system can operate with a peak time that is two-thirds that of the uncompensated system at 20% overshoot and with zero steady-state error for a step input. Use Root Locus Method.

3. A unity feedback system with forward transfer function

$$G(s) = \frac{k}{s(s+7)}$$

is operating with a closed-loop step response that has 20% overhoot. Do the following :
   (a) Evaluate the settling time 4
   (b) Evaluate the steady-state error for a unit ramp input. 4
   (c) Design a lag-lead compensator to decrease the settling time by 2 times and decrease the steady-state error for a unit ramp input by 10 times. Place the lead zero at –3. Use Root Locus Method. 12

4. For the system given below : 20



Use, Bode diagrams to design a lag compensator to yield a ten fold improvement in steady state error over the gain compensated system while keeping the percent overhoot at 9·5%.

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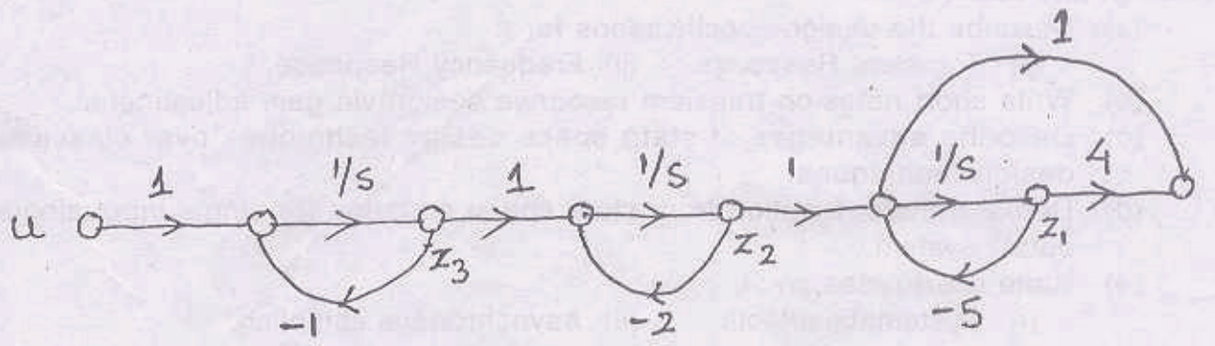
5. Design a state variable feedback controller to yield a 20·8% overshoot and a settling time of 4 seconds for a plant **20**

$$G(s) = \frac{(s+4)}{(s+1)(s+2)(s+5)}$$

that is represented in cascade form as shown in **figure**.



6. For a given system, **20**

$$G(s) = \frac{407\,(s+0\cdot916)}{(s+1\cdot27)(s+2\cdot69)}$$

Design an observer for the phase variables with a transient response described by damping ratio = 0·7 and w_n = 100.

7. Write short notes on any **two** :– **20**
   (a) A/D and D/A converters
   (b) Tracking effectiveness
   (c) Estimator Design.
