BE-sem-VII-old - Electrical

CS-II

19/12/15

QP Code : **2370**

(3 Hours) [**Total Marks : 100**

N.B. : (1) Question no. **1** is **compulsory**
(2) Attempt any **four** questions from remaining.
(3) Use graph paper and semi log paper where necessary.
(4) Assume suitable data wherever necessary.

1. (a) How is gain adjustment related to the transient response on the Bode diagrams? 5
(b) In order to effect a complete controller design, a system must be controllable. Describe the physical meaning of controllability. 5
(c) Where is the region for stability on the z-plane? 5
(d) Explain various programming units used in PLC. 5

2. (a) Design a lag-lead compensator for a unity feedback system to meet the following specifications: % OS=10%, Tp = 0.6 sec, and Kv =10. The forward path transfer function is 12

$$G(s)=\frac{K}{s(s+8)(s+30)}$$

(b) For a unity feedback system use frequency response method to detennine the value of gain, K. to yield a step response with a 20% overshoot if 8

$$G(s)=\frac{K}{s(s+4)(s+10)}$$

3. (a) For the plant $G(s)=\frac{100(s+10)}{s(s+3)(s+12)}$ 10

Design the phase-variable feedback gains to yield 5% overshoot and a peak time of 0.3 second.

(b) Design an observer for the plant 10

$$G(s)=\frac{10}{(s+3)(s+7)(s+15)}$$

operating with 10% overshoot and 2 seconds peak time. Design the observer to respond 10 times as fast as the plant Place the observer third pole 20 times as far from the imaginary axis as the observer dominant poles. Assume the plant is represented in observer canonical form.

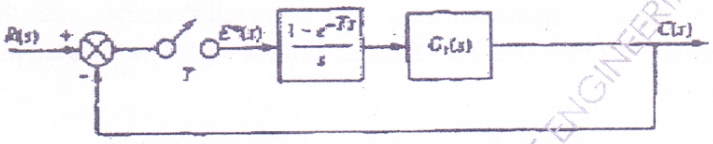
[TURN OVER]

4. (a) Given a z.o.h. in cascade with $G_1(s)$, find the sampled-data transfer function, G(z), if the sampling time, T, is 0.5 second. 10

$$G_1(s)=\frac{(s+2)}{(s+1)}$$

(b) For step, ramp, and parabolic inputs, find the steady-state error for the feedback control system sbown in Figure for T= 0.1 sec. if 10

$$G_1(s)=\frac{20(s+3)}{(s+4)(s+5)}$$



FigureQ4 (b)

5. (a) Explain relationship of memory word address to input output modules. 10
(b) Explain proportional and derivative kick w.r.t. PID controller. 10

6. (a) Explain PLC trouble shooting. 10
(b) Explain w.r.t. PLC 10
(i) Scan cycle
(ii) Counter instructions

7. Solve any **TWO** 20
(i) Data manipulation instructions w.r.t. PLC
(ii) Timer instructions
(iii) Transient response in Z plane
