Question Paper Code : 71514

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Aeronautical Engineering

EE 2365/EE 58/AE 1304/080180023/10122 AE 505 — CONTROL ENGINEERING

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

(Semi log sheet and Graph sheet should be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are basic components in electrical system?

2. What is the need for analogous quantities in various systems?

3. Compare and contrast : Open loop and closed loop control systems with examples.

4. Mention the various characteristics of Feedback Control Systems.

5. Name the test signals in control system.

6. List time domain specifications.

7. State Routh-Hurwitz stability criteria.

8. Why 'logarthmic scale' is used on x-axis to draw the bode plots?

9. Mention the stability condition for a sampled data control system.

10. Draw the generalized block diagram of a closed loop sampled Data control system.

PART B — (5 × 16 = 80 marks)

11. (a) Obtain the transfer function of the mechanical system shown in figure 11 (a)

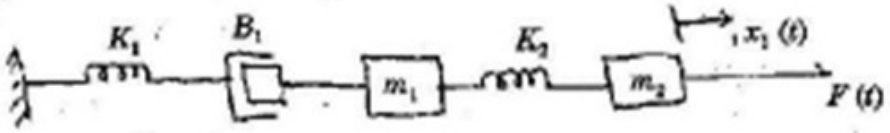

Fig. 11 (a)

Or

(b) Find the transfer function of the electrical network shown in figure 11 (b)

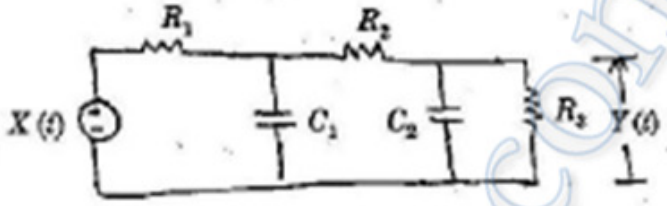

Fig. 11 (b)

12. (a) Obtain the transfer function (C/R) of a system shown in Fig. 12 (a) using block diagram reduction.

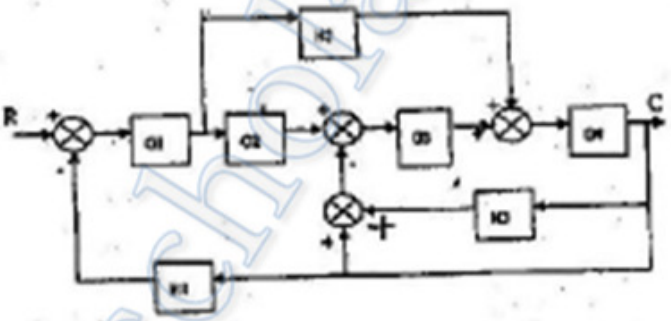

Fig. 12 (a)

Or

(b) (i) State and explain Mason's Gain Formula.

(ii) Obtain the overall gain (C/R) of the system shown in Fig. 12 (a) using Masons gain formula.

13. (a) Obtain the time response of a second order system for a unit step input and analyze the system performance when the damping ratio is less than one, equal to one and greater than one.

Or

(b) (i) A unity feedback system has an open loop transfer function $G(s)=\frac{K}{s(s+10)}$. If damping ratio is 0.5, Calculate

(1) Value of K

(2) Peak overshoot

(3) Time to peak overshoot

(4) Settling Time. (8)

(ii) Consider a unity feedback control system as in Figure 13 (b), obtain the steady state errors for unit step input, ramp input and parabolic input. (8)

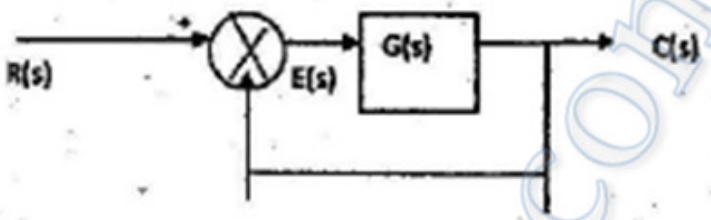

Figure 13 (b)

14. (a) Draw the Bode Plot for the following open loop transfer function and hence obtain gain cross over frequency.

$$G(s)=\frac{75}{s(0.1s+1)(0.5s+1)}.$$

Or

(b) Draw the root locus of the following loop transfer function when K varies from 0 to ∞

$$G(s).H(s)=\frac{K}{s(s+1)(s+2)}.$$

15. (a) (i) Explain in detail the functional block diagram of a Direct Digital Control (DDC) scheme. (8)

(ii) Describe two different ways that can be used to improve the quality of reconstruction of a continuous signal from its discrete time values in a DDC. Also outline relative advantages and disadvantages of the two methods. (4 + 4)

Or

(b) (i) From the fundamentals, derive an expression for the velocity form of digital PI and PID control algorithms. (6 + 6)

(ii) Explain the specific advantages of velocity form of digital PID algorithm over the position form. (4)