Name of subject : CONTROL SYSTEM AND PLC

Subject code   : 17536   **Unit Test : I**

Semester   : 5   **Course :EJ5G**

<u>**Chapter 1**</u>: **Introduction to control system (16 marks)**

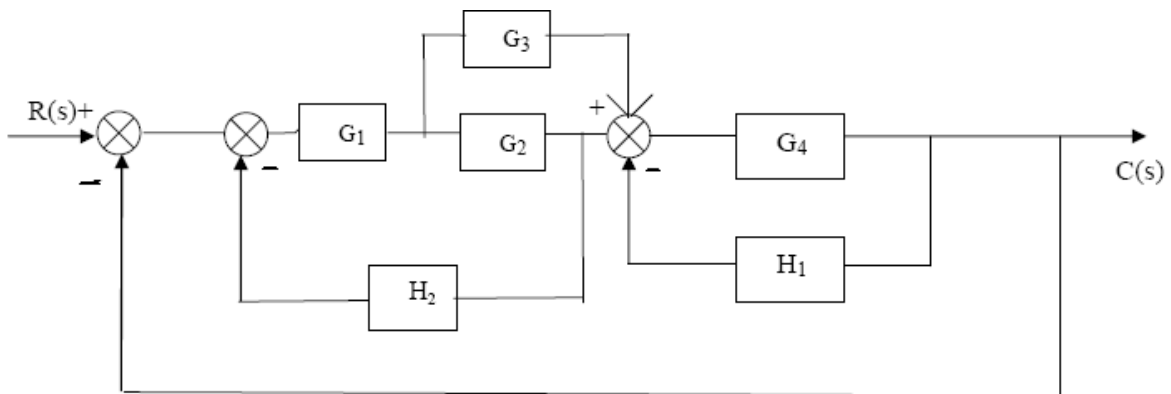**3 marks**

1) Define open loop and closed loop systemwith example.
2) Explain the significance of Laplace transform in control system.
3) Find the Laplace transform of f(t)= 2 t .
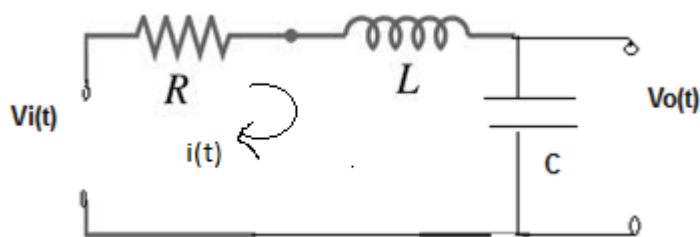4) Define order of the system and find order of following system

$$T(s) \; = \; \frac{(S+5)}{S(S+2)\,(S+4)}$$

4 marks

5) Derive the transfer function of system using block reduction techniques.

6) For the electrical system shown in fig. No.1 derive the transfer function Vo(s)/Vi(s)

7) Compare open loop and closed loop system.

8) Define transfer function and derive the transfer function for a general closed loop control system.

9) State any four block diagram reduction rules.

10)Obtain the transfer function of the given system by using block diagram reduction rules.
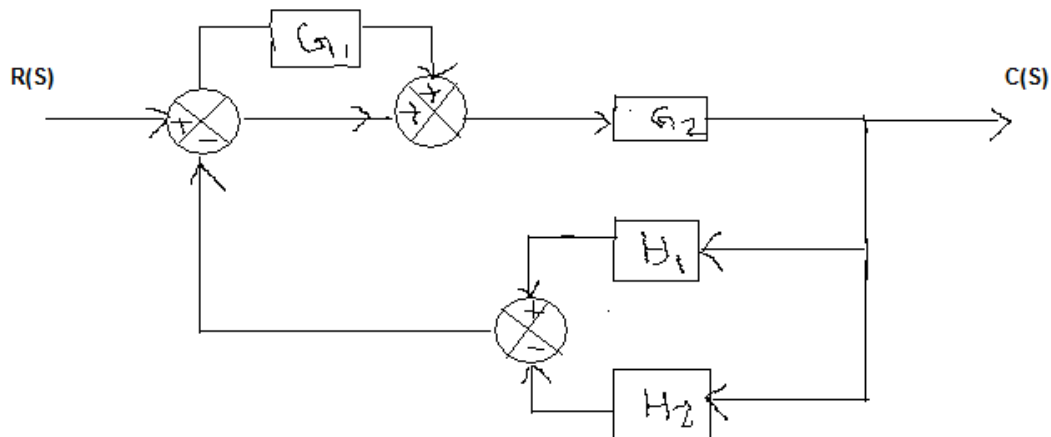
Chapter 2: Time response analysis (20 marks)

3 marks

11) Define the terms
          i)Poles ii) zeros iii) characteristic equation.
12) For a system having closed loop transfer function for unit step i/p determine
    1) wn   2) damping factor
    3) wd

$$T(S) = \frac{64}{S^2 + 5S + 64}$$

13) Define steady state error.What is the effect of step and ramp input on steady state error.
14) Define i) damping ratio ii) transient response iii) Type of the system

4 marks

15) For the given transfer function $C(s)/R(s) = (S+2)/S(S2+ 2S+ 2)(S2+7S+12)$ FindPoles, Zeros&Characteristic Equation

16) Draw the time response of second order underdamped control system with neat labelling.

17) Derive unit step response of 1st order system. Draw the response.

18) A second order system is given by

$$T(S) = \frac{25}{S^2 + 6S + 25}$$

Determine time domain specifications.

        i) Rise time ii) peak time iii) settling time iv) peak overshoot

19) Find error coefficients and steady state error for the transfer function

$$G(s).H(s) = \frac{10\,(s+1)}{s.(s+2)(s+5)}$$

where r(t)=3+10t

20) What are the standard test signals used in time domain analysis and state the mathematical statement for each.

21) Explain the effect of damping on response of 2nd order control system along with necessary graphs.

Chapter 3: Stability (12 marks)

3 mark

22) Define the following terms

  i) Stable System

  ii) Unstable System

  iii) Marginally stable system

23) Define the following frequency response specifications.

    i) Resonance peak ii) Bandwidth iii) gain margin.

24) State Routh's stability criterion. State their advantages.

4 marks

25) Determine the stability of the system whose characteristic equation is given as
$$S^6+2S^5+8S^4+12S^3+20S^2+16S+16=0$$

26) A system has $\quad G(s)H(s) = \dfrac{K}{S(S+2)\,(S+4)\,(S+8)}$

where K is positive. Determine the range of 'K' for the system to be stable.