



10ME82

**Eighth Semester B.E. Degree Examination, Feb./Mar. 2022
Control Engineering**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

1. a. Distinguish between open loop and closed loop control system, with suitable examples. (06 Marks)
- b. List and explain the ideal requirements of control system. (04 Marks)
- c. What is control action? Briefly explain proportional, proportional plus integral and proportional plus integral plus derivative controllers, with the help of block diagrams. (10 Marks)
2. a. Find the transfer function for the mechanical system shown in Fig.Q2(a).

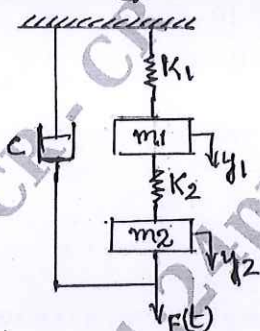


Fig.Q2(a) (10 Marks)

- b. With the help of circuit diagram for armature controlled DC motor, obtain transfer function, which relates angular displacement, θ of motor shaft to the armature input voltage. (10 Marks)
3. a. Obtain the closed loop transfer function of the block diagram shown in Fig.Q3(a).

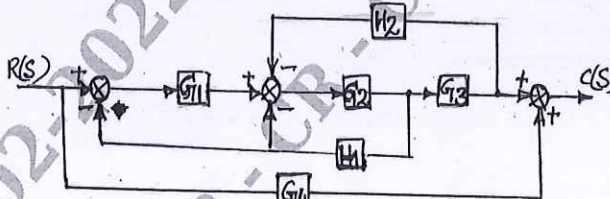


Fig.Q3(a) (10 Marks)

- b. For the signal flow graph shown in Fig.Q3(b), determine the transfer function using Mason's gain formula.

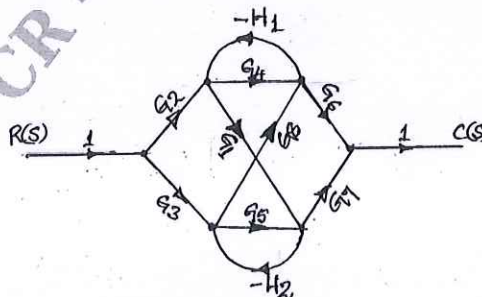


Fig.Q3(b) (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 4 a. Derive expressions for the response of a first order system, subjected to:
 (i) Step input (ii) Ramp input (08 Marks)
- b. A system oscillates with a frequency ω , has poles at $S = \pm J\omega$ and no poles in the right half of S-plane. Determine the values of K and a, so that the system shown in Fig.Q4(b) oscillates at a frequency of 2 rad/sec.

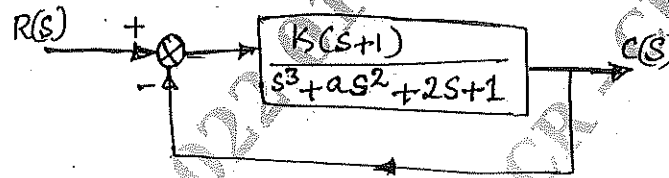


Fig.Q4(b)

(12 Marks)

PART - B

- 5 a. State and explain the Nyquist stability criterion. (06 Marks)
- b. Draw the Nyquist plot for a given open loop transfer function

$$G(s)H(s) = \frac{10}{s^3(1+s)}$$

(14 Marks)

- 6 Sketch the Bode plot and determine the gain and crossover frequencies and also find the stability of the system.

$$G(s) = \frac{10}{s(1+0.5s)(1+0.1s)}$$

(20 Marks)

- 7 Construct the root locus plot for the given system with open loop transfer function

$$G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+6)}$$

Also find the stability of the system.

(20 Marks)

- 8 a. Explain the need for system compensation. (04 Marks)
- b. Write notes on:
 (i) Lead compensator
 (ii) Lag compensator (16 Marks)
