

USN

--	--	--	--	--	--	--	--	--	--

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).

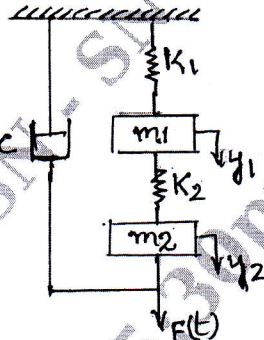


Fig.Q2(a)

- 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).

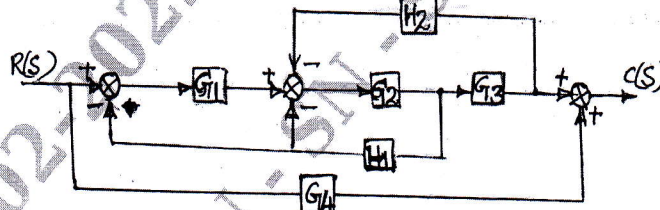


Fig.Q3(a)

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

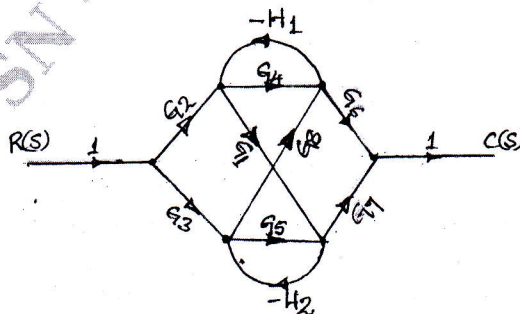


Fig.Q3(b)

(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.

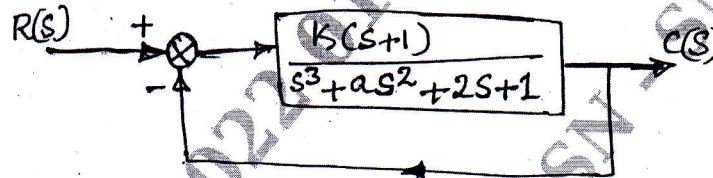


Fig.Q4(b)

(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)
