

CBCS SCHEME

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17ME73

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

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is a control system? State its ideal requirements. (08 Marks)
- b. With suitable mathematical expression, explain the following :
 - (i) Proportional-Integral control mode.
 - (ii) Proportional-Derivative control mode. (12 Marks)

OR

- 2 a. With a neat sketch, explain open loop and closed loop control system. Give one "day to day" life example for each. (12 Marks)
- b. Distinguish between open loop and closed loop control system. (08 Marks)

Module-2

- 3 a. Construct equivalent mechanical network and determine transfer function $\frac{X_1(s)}{F(s)}$ for the mechanical system shown in Fig. Q3 (a). (10 Marks)

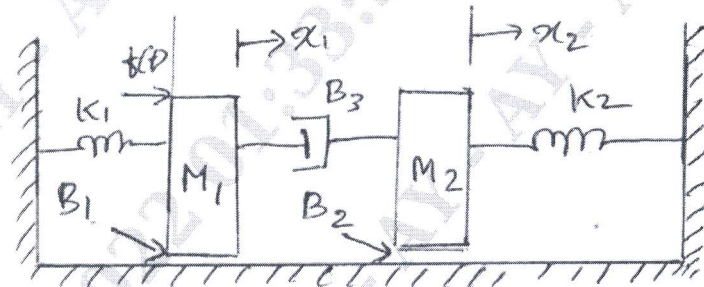


Fig. Q3 (a)

- b. Determine the transfer function $\frac{C(s)}{R(s)}$ for the system shown in Fig. Q3 (b). (10 Marks)

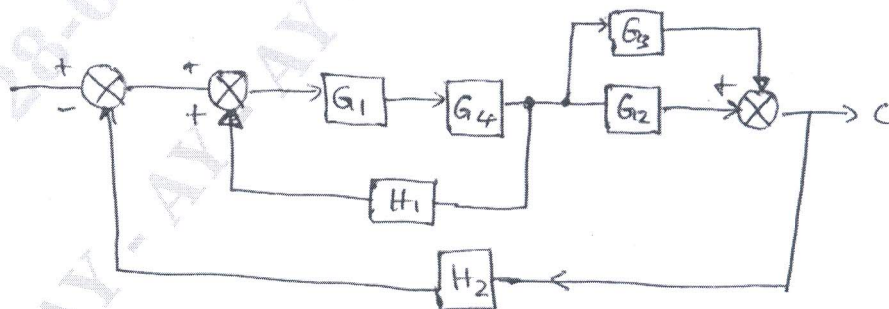


Fig. Q3 (b)

OR
1 of 2

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. For the mechanical system shown in Fig. Q4 (a), find the electrical analog based on force-current analogy. (12 Marks)

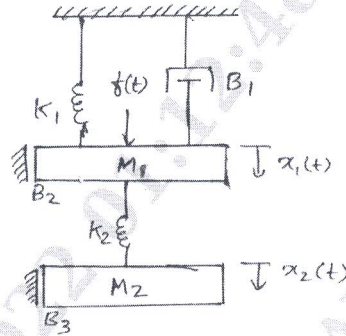


Fig. Q4 (a)

- b. With a neat sketch, obtain transfer function for a pneumatic actuator. (08 Marks)

Module-3

- 5 a. By using Routh's method comment on stability of system having characteristic equation, (10 Marks)
 $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$
 b. Sketch the root locus plot for a closed loop system having an open-loop transfer function, (10 Marks)
 $G(s)H(s) = \frac{K(s+2)}{s(s+1)}$

OR

- 6 Sketch the compute root-locus plot for the control system given by, (20 Marks)
 $G(s) = \frac{K}{s(s+2)(s^2+6s+25)}$

Module-4

- 7 Investigate the closed loop stability of the system using Nyquist stability criterion for open-loop system with transfer function, (20 Marks)
 $G(s)H(s) = \frac{5}{s(s+1)}$

OR

- 8 Draw Bode plot, determine GM, PM, W_{gc} , W_{pc} and comment on stability for a unity feedback control system having, (20 Marks)
 $G(s) = \frac{80}{s(s+2)(s+20)}$

Module-5

- 9 a. Explain (i) Lag-compensator (10 Marks)
 (ii) Lead-compensator (10 Marks)
 b. What is state variable analysis? What are its advantages?

OR

- 10 a. Define: (i) State (ii) State variables (iii) State space (10 Marks)
 (iv) State vector (v) State trajectory. (10 Marks)
 b. Obtain transfer function for a simple thermal system by mathematical modeling approach. (10 Marks)
