

22472

24225

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10
- a) List out any two practical applications of open loop and closed loop control system.
 - b) Define the term Transient Response.
 - c) Define absolute stability and relative stability.
 - d) Classify different modes of process control action.
 - e) Draw the effect of damping on the response of second order system.
 - f) State Routh's stability criteria.
 - g) Compare PI and PD controllers (Any two points)

P.T.O.

2. Attempt any THREE of the following :

12

- State and explain any four block diagram reduction rules.
- Define pole and zero. Give its S-Plane representation.
- State advantages and disadvantages of Routh's stability criteria.
- Draw a neat sketch of DC servo system and explain it.

3. Attempt any THREE of the following :

12

- Draw a neat sketch of variable reluctance type stepper motor. Also state applications of stepper motor. (Any four)
- Draw a neat sketch of electronic PID controller using op-amp.
- Define transfer function. Also list out advantages and disadvantages of it. (Any two each)
- Explain which control action is not used alone with reason ? State any two advantages and disadvantages of it.
- Explain working of potentiometer as an error detector.

4. Attempt any THREE of the following :

12

- Obtain transfer function of the given circuit. (Refer Fig. 1)

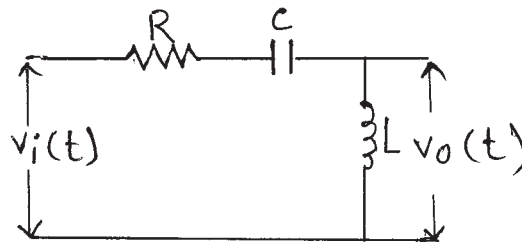


Fig. No. 1

- For the system having closed loop transfer function

$$\frac{C(S)}{R(S)} = \frac{18}{S^2 + 4S + 18}$$

Determine –

- Wd-damped frequency
- Peak time
- % Peak overshoot
- Settling time

- c) Determine stability of the system having characteristics equation.
 $S^5 + 2S^4 + 3S^3 + 4S^2 + 5S + 6 = 0$
- d) Draw a neat sketch of electronic proportional controller and its response. Also define proportional band of the controller.
- e) Explain working of synchro as an error detector.

5. Attempt any TWO of the following :

12

- a) Obtain transfer function $\frac{C(S)}{R(S)}$ using block diagram reduction rules of the following block diagram. (Refer Fig. 2)

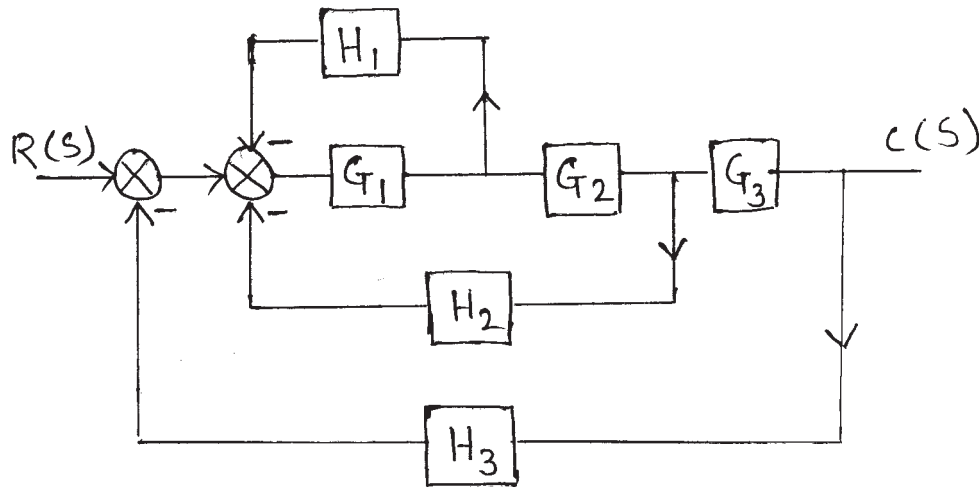


Fig. No. 2

- b) For the given transfer function

$$\frac{C(S)}{R(S)} = \frac{S(S+2)}{(S^2 + 2S + 2)(S^2 + 7S + 12)}$$

Find :

- Poles
 - Zeros
 - Pole-Zero plot on S-plane
 - characteristics equation.
- c) Explain the working of rotary encoder. State its two applications.

6. Attempt any TWO of the following :

12

- a) A unity feedback system has

$$G(S)H(S) = \frac{K}{S(S+2)(S+4)(S+8)}$$

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

- b) Draw a neat block diagram of process control system and explain each block.
- c) Compare AC servo system and DC servo system.
(Any six points)
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