

# 22476

**23124**

**3 Hours / 70 Marks**

Seat No. 

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

---

- 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.
  - (6) 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) State how AC servomotor differs from normal 2 phase induction motor.
  - b) Define transfer function. State advantages of transfer function.
  - c) Draw block diagram of servo system.
  - d) State the need of standard test signal used in time domain analysis.
  - e) Define the term damping.
  - f) State any four advantages of Pneumatic system.

P.T.O.

**2. Attempt any THREE of the following:** **12**

a) Derive the transfer function for RLC circuit.

b) For a given transfer equation –

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

Find :-

i) Poles

ii) Zeros

iii) Characteristic equation

iv) Pole-zero plot in S-plane.

c) Describe with diagram Pneumatic circuit for signal inversion.

d) Compare AC and DC servomotor.

**3. Attempt any THREE of the following:** **12**

a) Draw the unit step response of second order system and label it. Define settling time  $t_s$ .

b) Describe electronic PI controller with neat sketch.

c) Describe with diagram OR and AND functions of single acting cylinder Pneumatic circuit.

d) State any four block diagram reduction rules.

**4. Attempt any THREE of the following:** **12**

a) A unity feed back system is characterized by an open loop transfer function

$$G(s) = \frac{K(S + 13)}{S(S + 3)(S + 7)}$$

using Routh criteria calculate the range of values of K for the system to be stable.

b) Compare open loop and closed loop control system.

c) Draw and label solenoid actuator and explain its principle.

d) Explain ON-OFF controller with Neutral Zone.

e) Explain the working of variable reluctance stepper motor.

5. Attempt any TWO of the following:

12

a) Compare Pneumatic and hydraulic actuators.

b) A system has  $G(s) \cdot H(s) = \frac{K}{S(S+2)(S+4)(S+8)}$ 

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

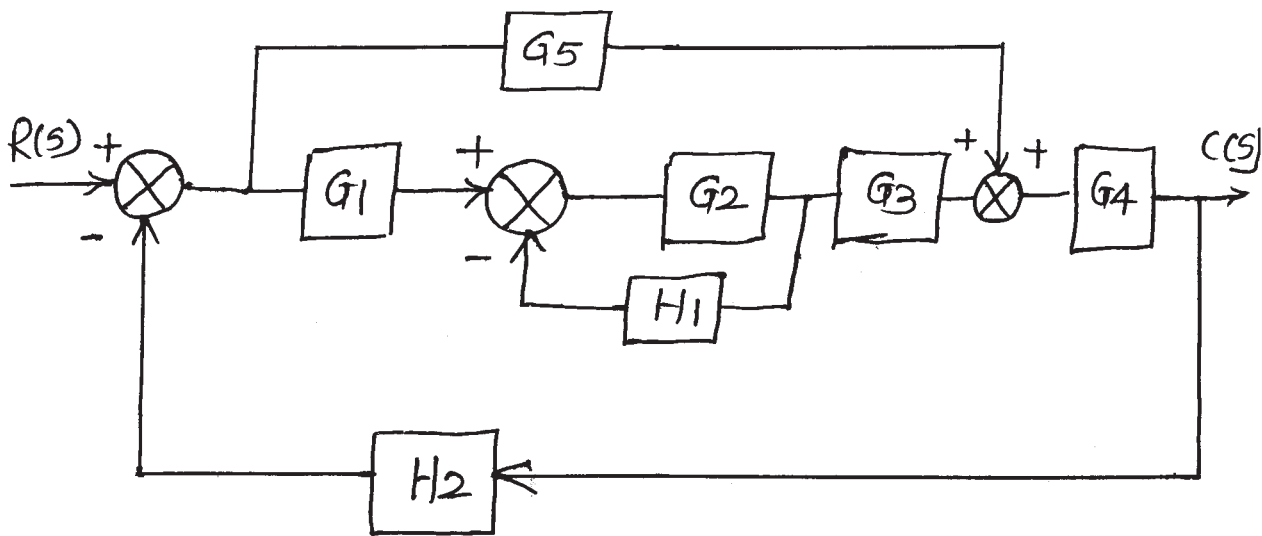
c) Obtain the transfer function  $C(s)/R(s)$  for the block diagram shown in Figure No. 1.

Fig. No. 1

6. Attempt any TWO of the following:

12

a) Explain PID control action. Draw electronic PID controller and state its equation.

b) Draw the block diagram of process control system. Explain role of controller in process industries.

c) A unity feed back system is given by

$$G(s) = \frac{16}{S(S+5)} . \text{ If step I/P is given find :-}$$

i) Rise time

ii) Peak time

iii) Maximum overshoot

iv) Setting time.