

22476

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.
(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) Define –
 - i) Transfer function.
 - ii) Order of system.
 - b) Define –
 - i) Rise time.
 - ii) Peak overshoot. State their equations.
 - c) Define offset. State any one method to reduce it.
 - d) Identify the number of ports and the number of positions of 2/2 directional control valve.
 - e) Classify servo system. Draw and label block diagram of DC servo system.
 - f) Draw and label BLDC motor.
 - g) Draw the Location of the Poles in the S-plane for stable and unstable systems.

P.T.O.

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

a) Find transfer function of RLC network.

b) Find out the poles and zeros for TF –

$$\frac{C(S)}{R(S)} = \frac{(S+4)}{S(S^2+10S+25)}$$

c) Describe with diagram the pneumatic circuit for signal inversion

d) Compare stepper motor and DC servo motor (Four points)

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

a) Find the state space representation for Transfer Function.

$$\frac{C(S)}{R(S)} = \frac{9}{(S^2+6S+9)}$$

b) Explain the principle of Double acting cylinder pneumatic actuator with diagram.

c) List standard test inputs. Draw graphical representation of them and give their Laplace transform.

d) State the equation and principle of Integral controller.

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

a) Explain proportional controller action with output equation and response. Define Proportional Band.

b) Find out the static error constants and steady state errors

$$\text{for a unity feedback system with } G(S)H(S) = \frac{80}{S(1+20S)}$$

c) Compare pneumatic and hydraulic actuators (Four points)

d) Describe the working of AC servo motor with diagram

e) Derive the transfer function of negative feedback system

5. Attempt any TWO of the following :

12

- a) Find out the range of K for the system to be stable for unity

feedback system with OLTF = $G(S) = \frac{K(S+13)}{S(S+3)(S+7)}$

- b) Derive the transfer function of the below system using block diagram reduction techniques (Refer Fig. No. 1)

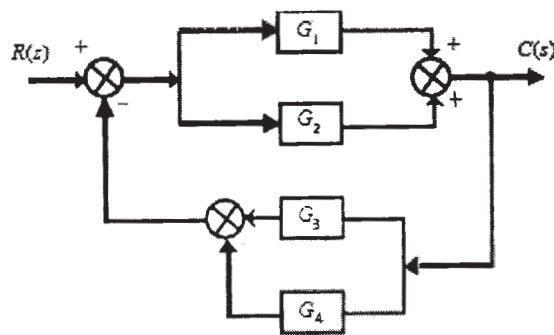


Fig. No. 1

- c) Describe with diagram OR and NOT functions of single acting cylinder pneumatic circuit.

6. Attempt any TWO of the following :

12

- a) Draw and describe the working of Synchro as error detector.
 b) Draw electronic PID controller and state its equation. State its advantages (any two)
 c) Find out the settling time and peak time for system with Transfer function

$$\frac{C(S)}{R(S)} = \frac{16}{S^2 + 4S + 16}$$
