24225

03 Hours / 70 Marks   Seat No.

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Figures to the right indicate full marks.

(4) 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) Draw the general block diagram of closed loop control system.

b) State Routh's stability criterion.

c) Compare PD and PID controllers. (Two points)

d) List different modes of control action.

e) Give application of rotary encoder.

f) Define servo system. Draw its Block diagram.

g) List practical applications of control system. (Any two)

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

a) List any four rules of block diagram reduction technique.

b) Sketch output time response relationship of second order system for step input. Define rise time and peak time.

c) Determine the stability of the system having characteristics equation:

$$s^4 + 2s^3 + 8s^2 + 4s + 3 = 0$$

d) Draw the block diagram of process control system. State function of each block.

P.T.O.

Marks

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

a) For a given transfer function $\dfrac{C(S)}{R(S)} = \dfrac{10\,(S+8)}{S\,(S+4)\,(S-3)}$

Find

i) Poles

ii) Zeros

iii) Plot them on S-plane

iv) Characteristics equations.

b) Define:

i) Absolute stability

ii) Relative stability

Draw the location of poles in s-plane for stability analysis.

c) Define on-off controller. Describe its working principle.

d) List the types of stepper motor and give four applications of stepper motor.

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

a) Compare open loop and closed loop control system. (Any four points)

b) Write the Laplace transform for the following input signal. Draw the signals

i) Step

ii) Ramp

iii) Parabolic

iv) Impulse

c) Determine stability of the system having characteristics equation

$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$

d) Describe PID controller with neat diagram, output equation.

e) Differentiate between linear and non linear control system.

Marks

5. **Attempt any TWO of the following:** 12

a) For unity feedback system the transfer function is

$$\frac{25}{s^2+6s+25}$$

Find

i) Rise time

ii) Peak time

iii) Settling time

b) For system, characteristic equation is $s^4+22s^3+10s^2+s+K=0$
Using Routh's Criteria calculate range of K for system to be stable.

c) Explain working of potentiometer as an error detector. Give any two applications.

6. **Attempt any TWO of the following:** 12

a) Derive transfer function of the given circuit. (Refer Fig. No. 1)
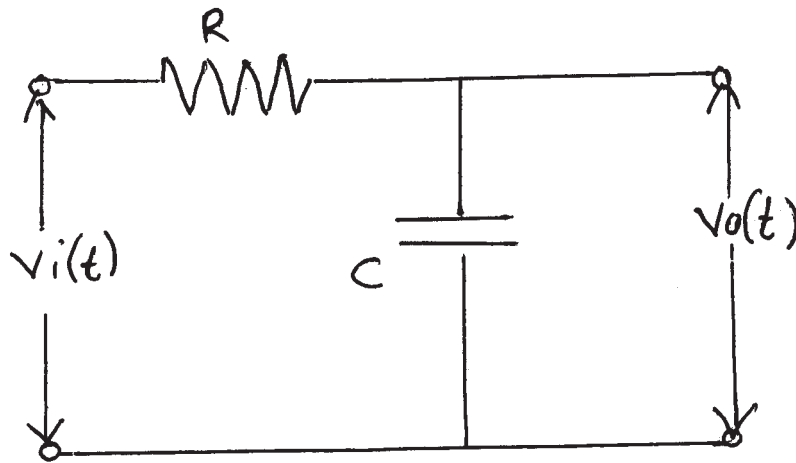
Fig. No. 1

b) Define following terms:

    i)   Damping

    ii)   Damping ratio

    iii)   Undamped natural frequency

    iv)   Damped frequency

    v)   Poles

    vi)   Zeros

c) Differentiate between Stepper Motor and DC Servomotor (six points)

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