313329

24225

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) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) 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 time variant and time invariant control system.

b) State the transfer functions of closed loop and open loop system.

c) Define –

i) Peak overshoot

ii) Settling time.

d) State the reason why derivative controller is not used alone.

e) Draw generalised block diagram of servo system.

f) Draw symbol of 2/2 and 3/2 directional control valve. (Normally open)

g) State applications of reed relay and solid state relay. (Any two for each)

P.T.O.

Marks

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

a) Obtain transfer function of the given circuit Refer Figure No. 1

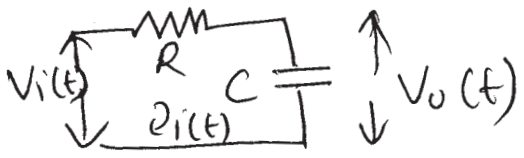

Fig. No. 1

b) For a system having T.F. = $\frac{64}{s^2 + 5s + 64}$ for unity step i/p determine –

i) wn

ii) ε

iii) wd

iv) Peak time.

c) Draw block diagram of process control system and explain each block.

d) Describe construction and working of single acting cylinder with neat diagram.

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

a) The transfer function of a system is given by
T.F. = $\frac{10(s + 7)}{(s^2 + 6s + 8)}$ obtain it's –

i) Poles

ii) Zeros

iii) Characteristic equation

iv) Sketch it's pole zero plot.

b) State and explain the condition of stable system and unstable system with location of poles on S-plane.

c) Explain operation of ON-OFF controller and define differential gap.

d) Differentiate between AC and DC servo motor. (Any four points)

Marks

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

a) Differentiate between open loop and closed loop control system. (Any four point)

b) State standard test inputs with their graphical and mathematical representation.

c) Explain operation of proportional controller with it's output equation and transfer function.

d) Draw and explain permanent magnet stepper motor.

e) Describe principal and working of electro-mechanical relay with neat diagram.

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

a) Find out the transfer function of following system using block diagram reduction method. Refer Figure No. 2.

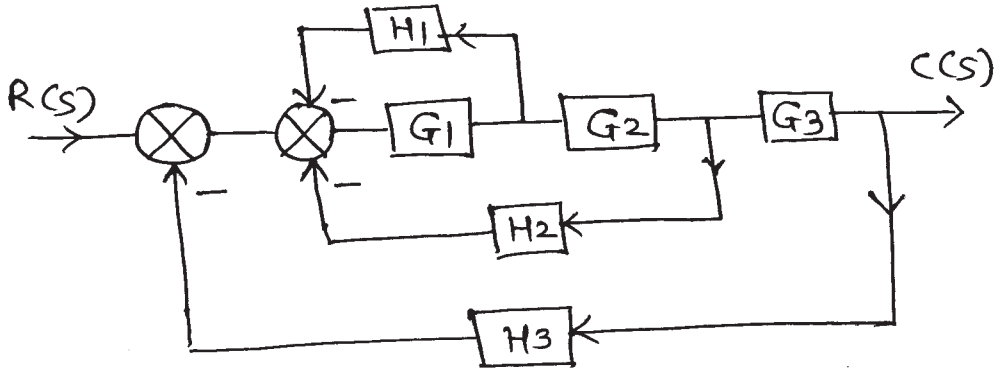

Fig. No. 2

b) Find range of values of K so that system with following characteristic equation will be stable.

$F(S) = S(S^2 + S + 1)(S + 4) + K = 0$

c) Compare PI, PD and PID controller. (Any six points)

Marks

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

a) For a system $G(s)H(s) = \frac{24}{s^2(s + 2)(s + 3)}$ determine –

i) Type of the system

ii) All error coefficient

iii) Corresponding steady state error.

b) Describe synchro as an error detector with neat diagram.

c) Compare pneumatic, hydraulic and electric actuators. (Any six points).