22531

12223

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 control system and give any two practical examples.

b) Define

i) Transient response

ii) Steady state response

c) State the classification of control actions.

d) Draw the symbols of NO and NC contacts used in PLC.

e) List Timer and counter instruction of PLC.

f) Define

i) Poles

ii) Transfer function

g) Draw the ladder logic diagram

i) NAND Gate

ii) EX-OR Gate

Marks

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

a) For the given transfer function

$$\text{T.F.} = \frac{10\ (S + 3)}{(S + 2)\ (S + 1)\ (S + 4)}$$ Find

i) Pole's

ii) Zero's

iii) Characteristics equation

iv) Plot Pole's and Zero's in S-plain.

b) State the need of PLC in automation.

c) Draw the ladder logic diagram

i) Half Adder

ii) Half Substractor

d) Explain scanning cycle of PLC.

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

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

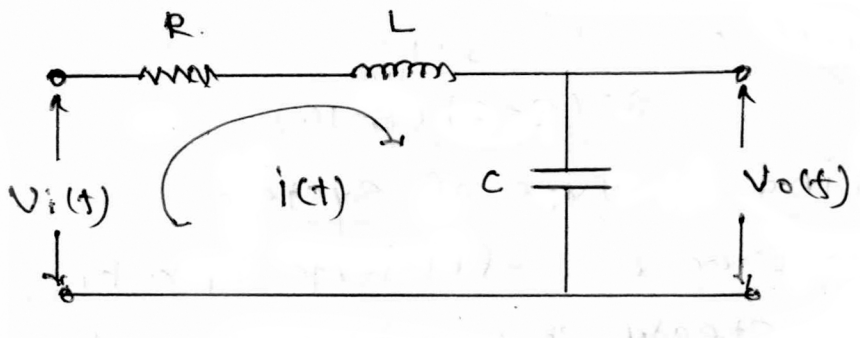

Fig. No. 1.

b) Describe ON-OFF control action with equation and response curve.

c) Sketch the block diagram of PLC.

d) Explain the Sourcing and Sinking concept in D.C. Input module.

Marks

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

a) Explain Propertional Integral (PI) controller with O/P response curve.

b) Distinguish between fixed and modular PLC. (any four points)

c) Sketch the block diagram of process control system and explain the function of each block.

d) Draw block diagram of AC discrete input module of PLC.

e) Explain memory organization of PLC.

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

a) For the given differential equation

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 8y(t) = 8x(t)$$

where $y(t)$ is O/P and $x(t)$ is I/P

Find, All Time Response Specification.

(ξ, T_r, T_p, T_d, T_s, $\%M_p$)

b) Find out transfer function by using block diagram reduction technique. Refer Fig. No. 2.

$$TF = \frac{C(S)}{R(S)} = ?$$

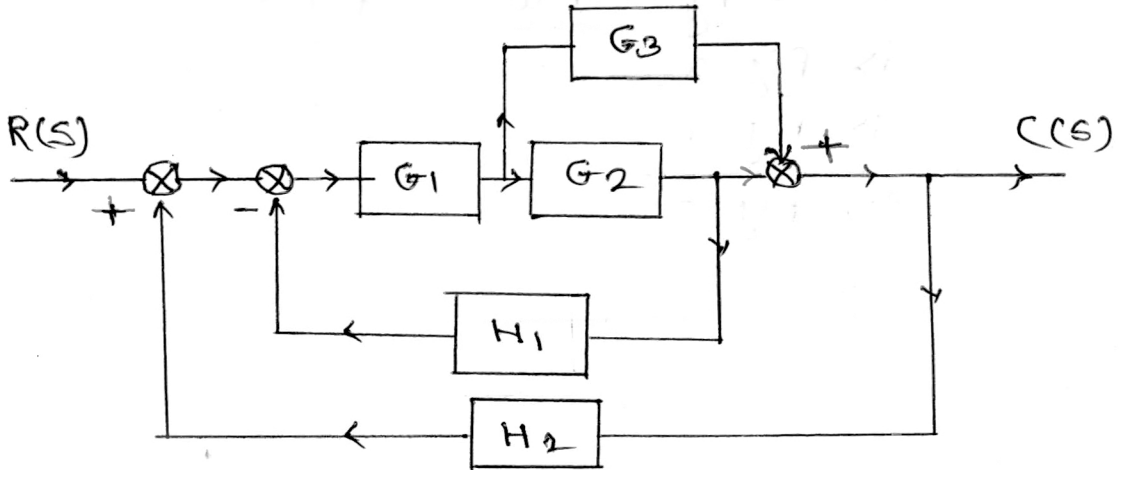

Fig. No. 2.

c) Calcualte range of K for the given unity feedback system to be stable with G(S).

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

P.T.O.

Marks

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

a) Define transfer function and derive the derivation of transfer function of closed loop control system.

b) A unity feedback system has

$$G(S) = \frac{10\ (S + 1)}{S^2(S + 2)\ (S + 10)}$$

Find.

i) Type of system

ii) Error coefficients k_p, k_v, k_a.

iii) Steady state error e_{ss}, for input $r(t) = 1 + 4t + \frac{t^2}{2}$.

c) Draw the ladder diagram for the following circuits. Refer Fig. No. 3, 4 and 5.

i)

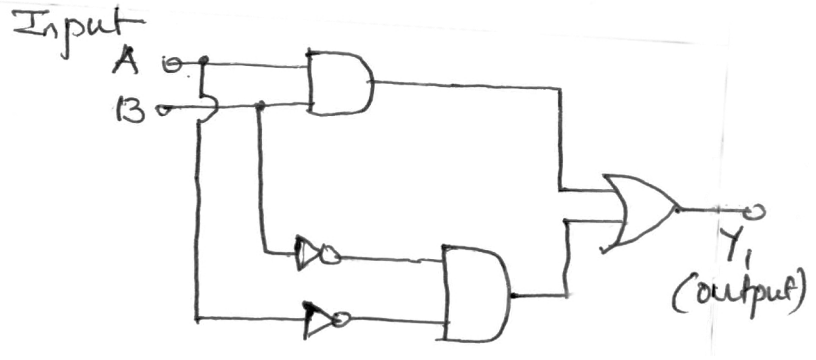

Fig. No. 3.

ii)

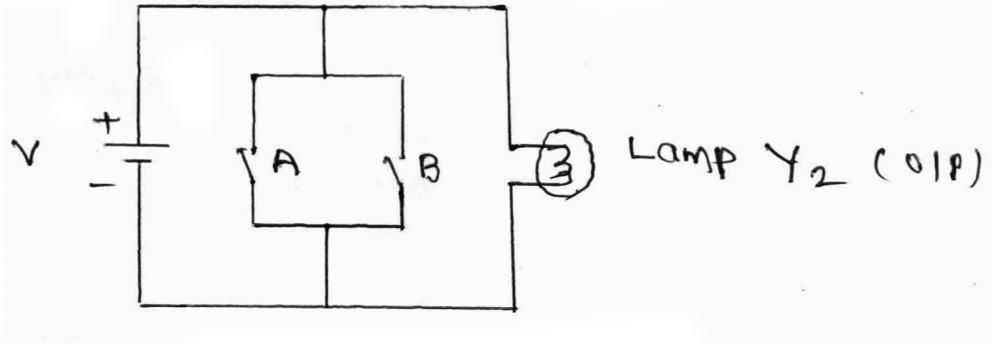

Fig. No. 4.

Marks

iii)

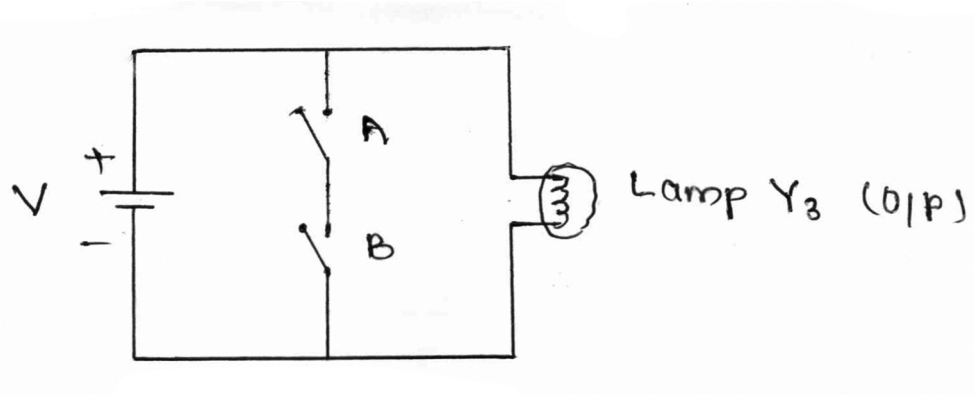

Fig. No. 5.