

22531

12223

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) 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

P.T.O.

2. Attempt any THREE of the following:

12

- a) For the given transfer function

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

- i) Pole's
 - ii) Zero's
 - iii) Characteristics equation
 - iv) Plot Pole's and Zero's in S-plane.
- b) State the need of PLC in automation.
- c) Draw the ladder logic diagram
- i) Half Adder
 - ii) Half Subtractor
- 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.

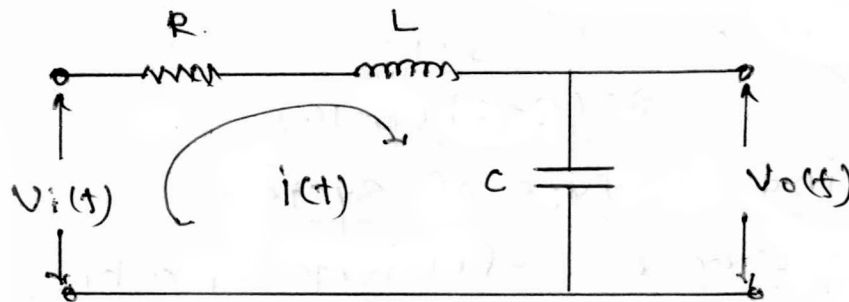


Fig. No. 1.

- 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.

4. Attempt any THREE of the following:

12

- Explain Proportional Integral (PI) controller with O/P response curve.
- Distinguish between fixed and modular PLC. (any four points)
- Sketch the block diagram of process control system and explain the function of each block.
- Draw block diagram of AC discrete input module of PLC.
- Explain memory organization of PLC.

5. Attempt any TWO of the following:

12

- 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 , $\%M_p$)

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

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

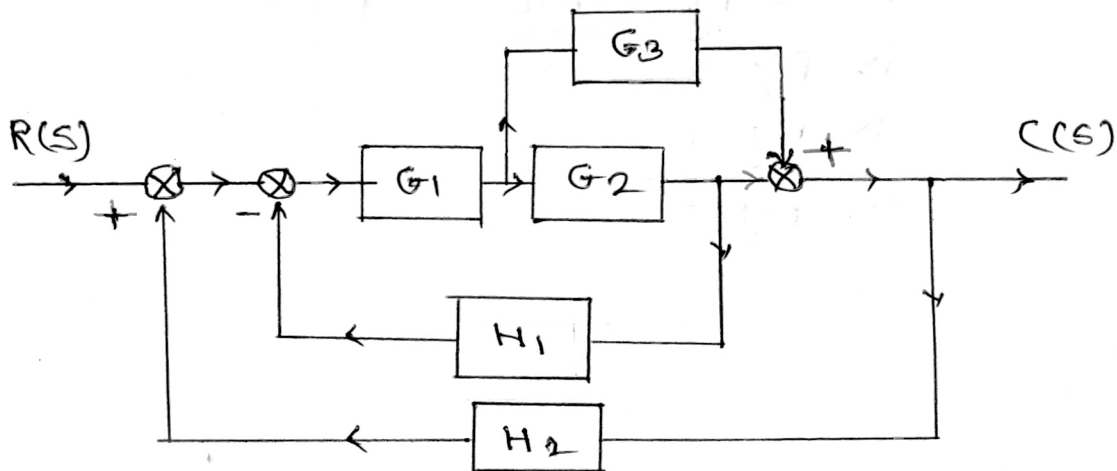


Fig. No. 2.

- Calculate 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.

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.

- Type of system
 - Error coefficients k_p , k_v , k_a .
 - 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)

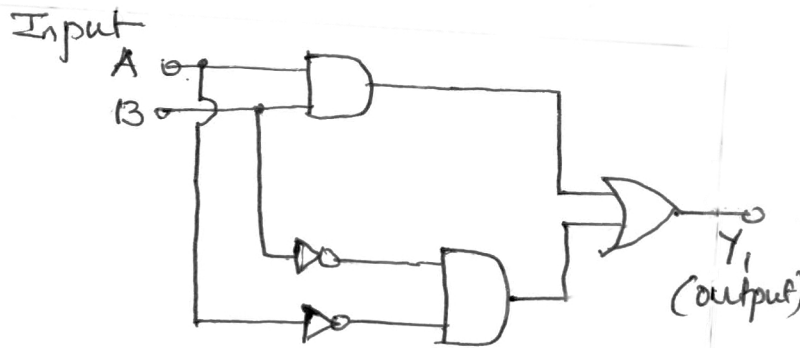


Fig. No. 3.

ii)

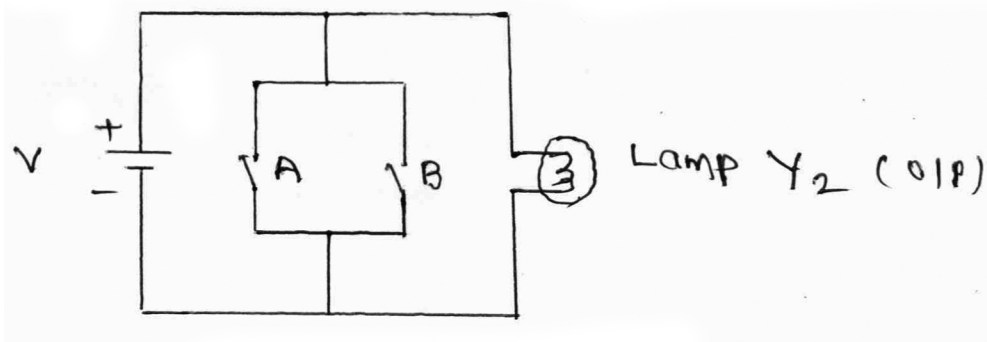


Fig. No. 4.

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[5]

Marks

iii)

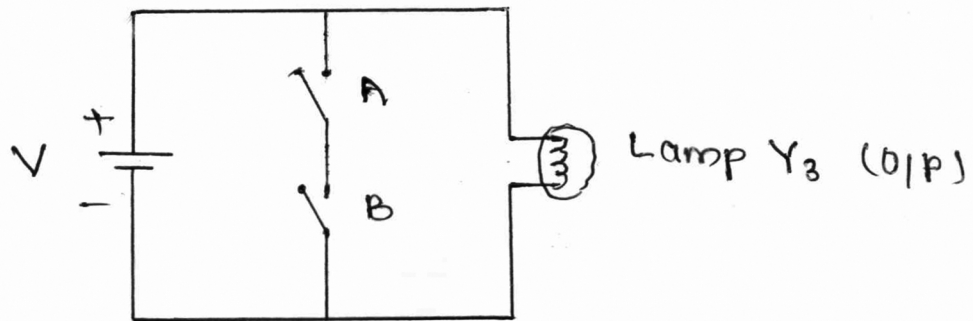


Fig. No. 5.
