11718

3 Hours / 100 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 : **20**

(a) Write any four applications and four Advantages of Servo System.

(b) Derive the transfer function of Fig. (1-b) using block diagram simplification method.

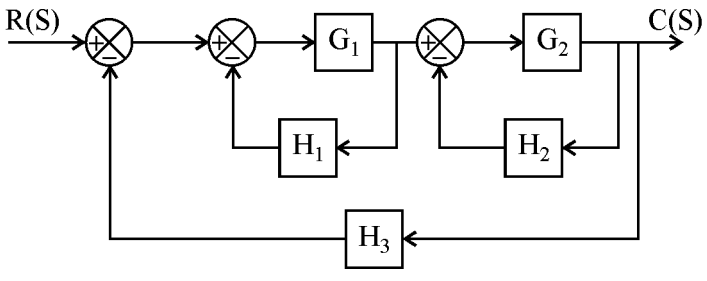


Fig. (1-b)

(c) Define the following term :

(i) Time Response

(ii) Transient Response

(iii) Steady State Response

(iv) Steady State error

(d) List the various factors which governs the selection of PLC for particular use. (minimum eight points)

(e) Draw and explain memory organization of PLC.

(f) Explain the sourcing and sinking concept in DC Input module.

(g) Define the following term :

(i) Neutral Zone

(ii) Control Action

2. Attempt any TWO : **16**

(a) (i) For a given Transfer function

$$T.F. = \frac{K\,(S + 7)}{S\,(S + 2)\,(S + 5)\,(S^2 + 7S + 12)}$$

find (i) Pole (ii) Zero (iii) Characteristics equation (iv) Pole Zero plot

(ii) (1) Find the Transfer function of a given differential equation. **2**

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

(2) Define : (a) Logical Instructions **1**

(b) Data Handling Instructions. **1**

(b) (i) A system has $G(S) \cdot H(S) = \frac{K}{S(S+2)(S+4)(S+8)}$ where K is positive

Find (1) Characterstics equation

(2) Rang of K value for stability.

(ii) Draw electronic PID controller and explain operation of its each stage.

Give two advantages and two disadvantages of Electronic Controller.

(c) Draw the basic block diagram of PLC and write the function of each block.

3. Attempt any FOUR : **16**

(a) Compare open loop system and closed loop system on the basis of following point :

(i) Feedback path

(ii) Complexity of design

(iii) Cost and maintenance

(iv) Accuracy and bandwidth

(b) Define the following term related to PLC :

(i) Scanning Cycle

(ii) Scanning

(iii) Scan Time

(iv) Speed of Execution

(c) Derive an expression for unit step response C(t) of first order system. Also draw Response Curve.

(d) Define following term related to control action :

(i) Controller

(ii) Error Signal

(iii) OFF Set

(iv) Proportional Band

(e) Give the functional descriptions for following Timer Instructions :

(i) ON Relay

(ii) OFF Relay

(iii) Retantive

(iv) Reset

(f) What is the importance of stability ? Define absolute & relative stability.

4. Attempt any TWO : **16**

(a) A unity feedback system with open loop transfer function.

$$G(S) = \frac{10\,(S + 2)\,(S + 3)}{S\,(S + 1)\,(S + 4)\,(S + 7)}$$

Find out (i) Types of system and K_p, K_v, K_q.

(ii) Steady state error for input = $3 + t + t^2$

(b) Compare Relay logic control and Programmable logic control. (minimum eight points)

(c) Draw ladder diagram for 3 motor operation for following condition :

(i) Start push button, start motor M_1.

(ii) When motor M_1 is ON after 8 minute M_2 is ON and M_1 is OFF.

(iii) When M_2 is ON after 15 minute M_3 is on and M_2 is OFF.

(iv) When stop push button is pressed M_3 is OFF.

5. Attempt any FOUR : **16**

(a) Compare proportional and Integrated controller on the basis of following point :

(i) Equation

(ii) Advantages

(iii) Response to Error

(iv) Application

(b) Define transfer function and derive the expression of transfer function of closed loop system with positive feedback.

(c) Write any four rules of block diagram simplification.

(d) Define and write the formula of following :

(i) Delay time (t_d)

(ii) Settling time (t_s)

(iii) Peak time (t_p)

(iv) Peak over shoot (M_p)

(e) Write any four advantages and disadvantages of Routh's criterion.

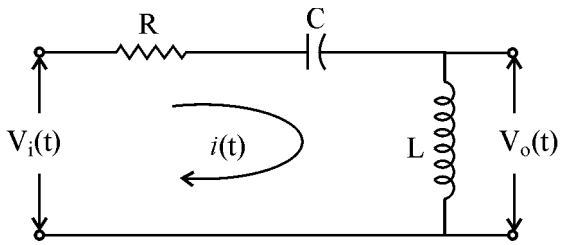
(f) Draw the block diagram of AC Discrete Input module of PLC.

6. Attempt any FOUR : **16**

(a) Give the functional descriptions for AND, OR, EX-OR and NOT instructions.

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

(c) Derive the Transfer Function of following circuit :



(d) What are the Different Standard Test Signal ? Draw them and give their Laplace representation.

(e) Define the following term :

(i) Stable System

(ii) Unstable System

(iii) Relatively Stable System

(iv) Critically Stable System

(f) Draw the ladder diagram to verify

(i) AND Gate logic

(ii) NOR Gate logic
