(3 Hours)   **Total Marks : 100**

N. B. : (1) **Q. No.1** is **compulsory**.
    (2) **Attempt** any four questions from the rest.
    (3) Use of **graph** paper or remilog paper is **compulsory** wherever **required**.
    (4) **Figure** to the right indicates **full** marks.

1.   Solve **any four**.
    (a) Explain the issues in implementing PID controller.   5
    (b) Which plant representation lends itself to easier design of Observer &   5
        Controller.
    (c) Explain the stability criterion of Digital system.
    (d) Explain the PLC Programming Units.   5
    (e) Explain the Latch output & Unlatch output instruction of PLC.   5
                                                                               5

2.
    (a) For a unity feedback system with a forward transfer function   10

        $G(s) = \dfrac{K}{s(s+50)(s+120)}$ Use frequency response technique to find the

        value of gain "K" to yield 20% overshoot.
    (b) Explain the concept of Controllability & Observability of a system.   10

3.

(a) For the given plant, $G(s) = \dfrac{100(s+10)}{s(s+3)(s+12)}$

                                                                               10
    Design the phase variable feedback gain to yield a 5% overshoot and
    peak time of 0.3seconds.

    (b) Given a Z.O.H. in cascade with $G_1(s) = \dfrac{8}{(s+4)}$, Find the sampled data   10

        transfer function G(z). If sampling time T is 0.25 sec.

4.

    (a) Design an observer for the plant $G(s) = \dfrac{(s+4)}{(s+1)(s+2)(s+5)}$ which is   10

        represented in observer canonical form to yield 20.8% overshoot & settling
        time of 0.4 sec.
    (b) What is Derivative kick? Explain with block diagrams, how to overcome   10
        the problem of derivative kick.

[TURN OVER