Sem VI / Process Inst. & sy. / INST / 12-05-1

QP Code : 5073

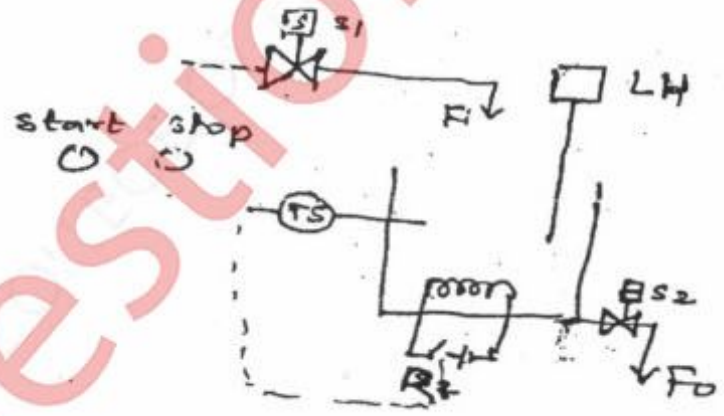
(3 Hours) **[Total Marks : 80**

N.B. : (1) Question no. **1** is **compulsory**.
(2) Attempt **any three** questions out of remaining questions.
(3) Assume **suitable data** if required.

1. Answer **any four.**
   (a) Compare feedback and feedforward control system.
   (b) Explain terms (i) Control Recipe (ii) Master recipe.
   (c) Explain Process Reaction Curve method for tunning.
   (d) State features of PID controller.
   (e) Explain neutral zone and its significance in on-off controller.

2. (a) Explain Cascade control with an example. Also comment on, which controller of the two (primary and secondary) should be faster with reasons. **10**
   (b) Explain pneumatic PID controller. **10**

3. (a) For a temperature control system which inputs the controlled variable as a range from 0V to 4V. The output is a heater required to give 0V to 8V. A PID is to be used with $k_p = 2.4\ \%/\%$, $k_I = 9\ \%/\%$ min & $k_D = 0.7\ \%/\%/\text{min}$. The period of fastest expected change is estimated to be 8 seconds. Develop the electronic PID circuit. **10**
   (b) Draw different symbols used in physical ladder diagram for **10**
   (i) Relays (ii) Motor (iii) Solenoid (iv) Lights (v) Switch.



Develop Ladder logic for following system using physical ladder elements. Start and Stop are buttons used to Start and Stop system S1, S2 and R1 are Solenoid valve and Relays.
S1 is used to fill the system (Tank) and R1 is used to Start Heater. L_H is Level sensor when Level is reached, start heating liquid. When Temperature is reached (Ts=High) stop heating using R_1 and open Solenoid valve S2.

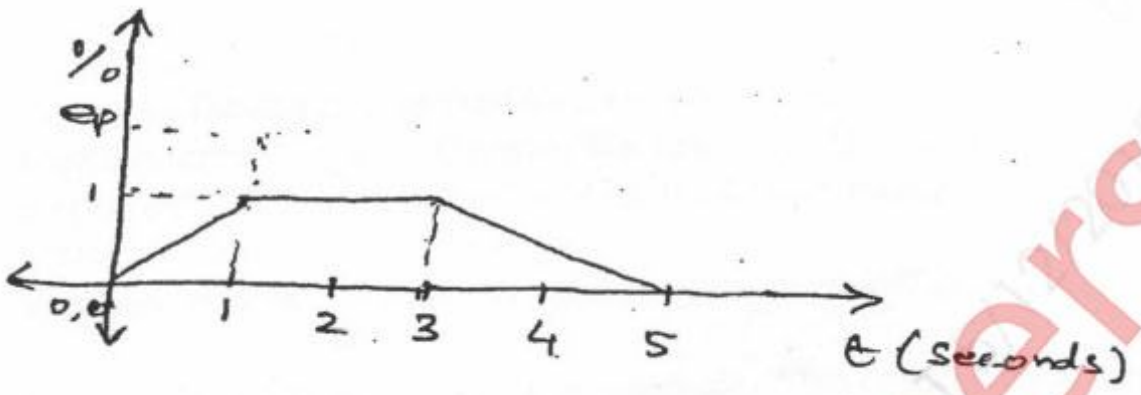
[TURN OVER

4. (a) Why safety is Required in Process Industry. Explain Selective control system for Boiler Protection. **10**

   (b) Explain RGA method in detail. **10**

5. (a) Explain Self tuning Regulator for adaptive control. **10**

   (b) **10**



Draw the plot of Three mode controller output for the error plot shown above. Assume $K_p = 5$, $K_I = 0.7s^{-1}$, $K_D = 0.5s$ and $p_I(0) = 20\ \%$.

6. Short notes on **Any Two.** **20**

   (a) Dead time and Smith Predictor Compensator.

   (b) Non-Interacting system.

   (c) Decoupler Design.
