Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PEEE 5407

Seventh Semester Back Examination – 2014

INDUSTRIAL AUTOMATION AND CONTROL

BRANCH (S) : AEIE, EC, EEE, ETC, IEE

QUESTION CODE : L195

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 ×10
   (a) Define controlled variable, manipulated variable, and load variable with suitable example.
   (b) Define resistance and capacitance of a process. What do you mean by dead time in a process ?
   (c) Define proportional band (PB).
   (d) State and explain elements of a controller.
   (e) What do you mean by offset error ? How do you overcome it ?
   (f) List major functions of an adaptive control process.
   (g) State the condition to use Split-range control scheme in a process.
   (h) What is the difference between relay diagram and ladder diagram ?
   (i) What do you mean by real time programming ?
   (j) Which is a single mode controller that cannot be used alone and why ?
2. (a) Describe the characteristics of Proportional control, Integral control and Derivative control. Write suitability and limitations of their applications in process control. 5
   (b) Explain non-interacting position PID algorithm. 5
3. (a) A self-actuating PI controller is used to control the trmperature of a process. The following data is known : 100% measurement input = 200 ^{0}F deviation in process temperature; 100% controller output = $\frac{3}{4}$ inch valve deviation; PB = 20%; Reset rate = 2 Repeats/min; The process temperature suddenly

P.T.O.

deviates by 2 ^{0}F above the set point and remains there. Calculate the total valve deviation after 2 minutes. 5

(b) Draw the block diagram of a cascade control system and describe the function of each unit. Write the characteristics of cascade control. 5

4. (a) Explain the working principle of feed forward control of distillation column. 5

(b) Discuss the auctioneering control of catalytic tubular reactors with highly exothermic reaction. 5

5. (a) Discuss different Pneumatic actuation methods with suitable diagram. 5

(b) Explain the control strategy used in Figure 1 below. 5

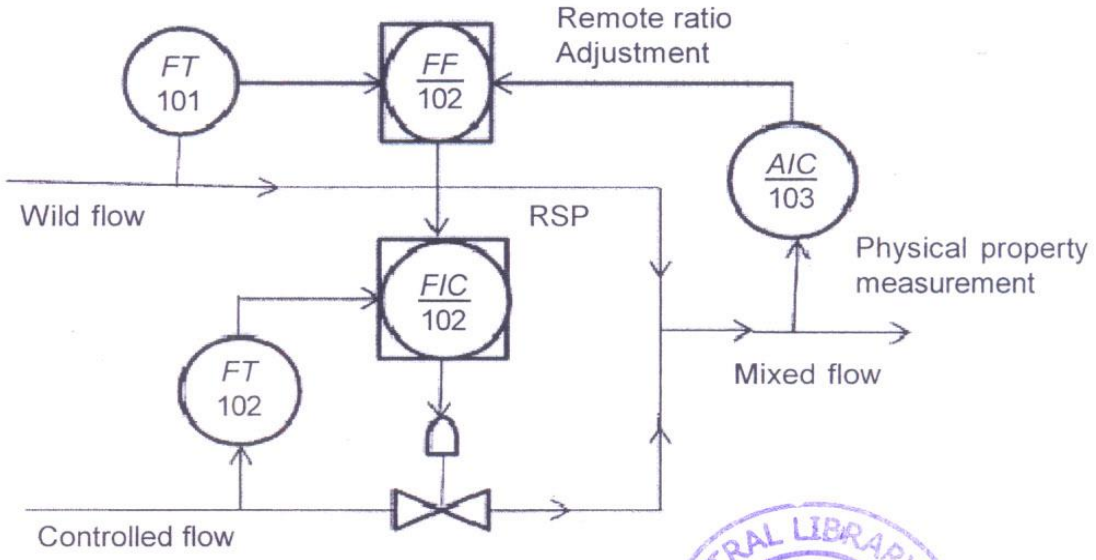

Figure 1

6. (a) Explain the working principle of relay. 5

(b) Three tanks containing oil have to be monitored continuously. Design a warning system to light up whenever two or more tanks are empty. A NO switch at the bottom of each tank gets energized whenever a tank is found empty. 5

7. (a) Draw a hierarchical DCS structure and explain function at each level. 5

(b) Give an example of multi-tasking process. Draw and describe state transition diagram of tasks. 5

8. Write short notes on any **two** of the following : 5×2

(a) Feed forward-feedback control configuration

(b) Control Valves

(c) End-point control

(d) Gain scheduling adaptive control.