

- N. B. :
1. Q. No 1 is compulsory.
  2. Attempt any THREE questions from Q No 2 to Q No 6.
  3. Figures to the right indicate full marks.
  4. Assume suitable data wherever necessary.

1. Solve any Four :

(20)

- a) What is cavitation? Write its ill effects.
- b) Explain the reliability engineering terms : MTTR, MTTF and MTBF.
- c) Define control valve coefficient. Give the factors that affect this coefficient.
- d) Explain the need of thermocouple compensation, during design of Thermocouple.
- e) Define ergonomics. How ergonomics is applied in designing control panel?

2.

- a) Find the appropriate valve size for the following : (10)  
Fluid- Dry saturated steam, Flow rate : 63000 lb/hr, inlet pressure = 245psia,  
Outlet pressure = 215psia, pipe diameter = 6" sch 40,  
Valve is eccentric disk type  $C_d = 27$ ,  $X_T = 0.25$

- b) Discuss the various factors to be added while sizing of a control valve for compressible fluids flow. (10)

3.

- a) Find the appropriate valve size for the following : (10)  
Fluid - Water, Flow rate = 1600gpm, inlet pressure = 42.6psia,  
outlet pressure = 34.7psia, Pipe diameter = 8" schedule 40 pipe,  
Specific gravity = 0.88, Type of valve is 60-degree butterfly valve with  $C_d = 17$ .

- b) Explain the steps to be followed for System Engineering. (10)

4.

- a) Write the guidelines for enclosure design. (10)

- b) Given the following data, calculate the appropriate valve size : (10)

Fluid - Air flow  $w_g = 460$  lb/hr mixed with Water flow  $w_f = 20,000$  lb/hr,  $F_f = 0.96$ ,  
 $P_v = 0.5$  psia,  $P_1 = 100$  psia,  $\Delta P = 36$  psi,  $T_1 = 540^\circ R$ ,  $X_T = 0.75$ ,  $M = 29$ ,  
 $D = 3$  inch schedule 40, Valve is Globe valve with  $C_d = 5$ ,  $F_L = 0.90$ ,  
 $V_f = 0.01607$  ft<sup>3</sup>/lb.

- a) Explain the Orifice design criteria. (10)

- b) Draw a typical Control room layout diagram and explain the guidelines to design it. (10)

6. Write short note on :

- a) Control valve noise. (10)

- b) Bath tub curve and its significance in relation with Reliability. (10)