

- 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 $C_d = 5$, $F_L = 0.90$,
 $V_f = 0.01607$ ft³/lb.

 5. 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)
-