1. Classify the following as system, control volume or neither. Give reason for each.
a) Melting ice cube b) Air being filled in a cycle tyre c) LPG being filled in LPG cylinder d) sand in sand clock e) a spring in a machine f) air conditioner g) a domestic refrigerator h) water in a tub heated by immersion heater i) water flowing through a tap j) a cloth drying in still air k) water in a cup drying up over days l) a growing apple on a tree m) air in an air pillow n) a tube light o) a gas stove burner p) a water jet of known diameter hitting a perpendicular plate q) a spherical lump of solid carbon(coal) burning, r) compression in a piston s) compression in a continuous flow compressor and t) heating in a closed chamber

2. Classify the following quantities as extensive or intensive:
a) P b) T c) V d) E + PV e) PT/V f) PV/T g) Pm/T h) PV/T^2.

3. Discuss the path independence of the following quantities
a) $\int_1^3 P dV$, b) $\int_1^3 V dP$, c) $\int_1^3 (P + V) dV$, d) $\int_1^3 (P dV - V dP)$

4. I) Write the following pressures in kPa (density of mercury 13.6 g/cm^3 and of water 1 g /cm^3) a) 90 cm Hg gauge b) 40 cm Hg vacuum c) 1 m H_2O gauge d) 0.5 bar II) Write following absolute pressures in gauge pressure in mm Hg a) 0.5 bar absolute b) 5 bar absolute c) 20 cm Hg absolute d) 800 mm Hg absolute

5. An inclined manometer has the inclined arm at an angle of 30° to the horizontal. The manometer is used to measure pressure of a gas. The liquid inside the manometer gas density of 1 g/cm^3. If the length of liquid column along the inclined arm (or the manometric reading) is 20 cm and atmospheric pressure 101 kPa, what is the gauge pressure and absolute pressure of the gas? Which of the two pressures would you use for calculating the density of gas?

6. Consider a thin horizontal tube 1 m long sealed at both ends. The middle 10 cm of the tube contains mercury and rest of the tube contains air at atmospheric pressure (= 760 mm Hg).The tube is now brought to a vertical position. How far will the mercury fall? Assume that changes in the pressure and volume of the air are related by PV= constant
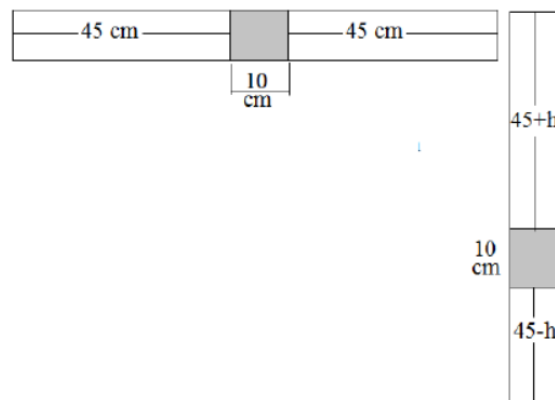
7. Derive work done during a process from (P1, V1) to (P2, V2).
If the process is, (a) constant Volume, (b) Isothermal process, (c) Polytropic process, (d) Isobaric process, (e) adiabatic process.

8. Calculate the temperature at which
(a) Celcius scale reads the same number as Fahrenheit scale
(b) Kelvin scale reads the same number as Fahrenheit scale
(c) Rankine scale reads the same number as Celcius scale
(d) Rankine scale reads the same number as Kelvin scale
(e) Rankine scale reads the same number as Fahrenheit scale