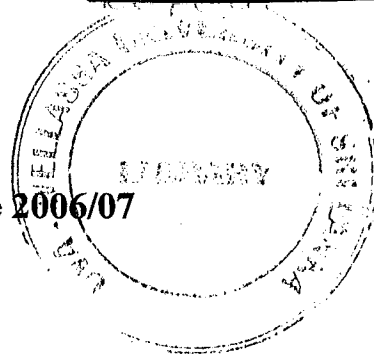


Uva Wellassa University, Sri Lanka
B.Tech Degree Programme 2006/07
BSc in Computer Science Degree Programme 2006/07



End Semester Examination - Repeat

January 2009

ENG 203-2 Engineering Physics

Instructions

Answer for **All** questions

No. of questions: Four (04)

No. of pages: Three (03)

Time: Two hours

Clearly state any assumptions made.

You can assume any missing data.

Tables of properties are provided in the exam hall

Question 01

- (a) A can of soft drink at room temperature is put into the refrigerator so that it will cool. Would you model the can of soft drink as a closed system or open system? Explain. (20%)
- (b) Determine the phase or phases in a system consisting of H_2O at the following conditions and sketch p - v and T - v diagrams showing the location of each state. (30%)
- I. $p = 5 \text{ bar}$, $T = 151.9^\circ \text{C}$.
 - II. $p = 5 \text{ bar}$, $T = 200^\circ \text{C}$.
 - III. $p = 2.5 \text{ MPa}$, $T = 200^\circ \text{C}$.
 - IV. $p = 4.8 \text{ bar}$, $T = 160^\circ \text{C}$.
 - V. $p = 1 \text{ bar}$, $T = -12^\circ \text{C}$.
 - VI. $p = 22.09 \text{ MPa}$, $T = 374.14^\circ \text{C}$
- (c) A piston cylinder device contains 0.1 m^3 of liquid water and 0.9 m^3 of water vapor in equilibrium at 800 kPa . Heat is transferred at constant pressure until the temperature reaches 350°C . (50%)
- a) What is the initial temperature of the water?
 - b) Determine the total mass of the water.
 - c) Calculate the final volume.
 - d) Show the process on a P - v diagram with respect to saturation lines.

Question 02

(a) A 1 m^3 tank containing air at 25°C and 500 kPa is connected through a valve to another tank containing 5 kg of air at 35°C and 200 kPa . Now the valve is opened and the entire system is allowed to reach thermal equilibrium with the surroundings, which are at 20°C . Determine the volume of the second tank and the final equilibrium pressure of air.

(40%)

(b) A furnace wall is made up of three layers of thicknesses 250 mm , 100 mm and 150 mm with thermal conductivities of 1.65 , k and $9.2 \text{ W/m}^\circ\text{C}$ respectively. The inside is exposed to gases at 1250°C with a convection coefficient of $25 \text{ W/m}^2^\circ\text{C}$ and the inside surface at 1100°C , the outside surface is exposed to air at 25°C with convection coefficient of $12 \text{ W/m}^2^\circ\text{C}$. Determine:

- The unknown thermal conductivity ' k '
- The overall heat transfer coefficient
- All surface temperatures.

(60%)

Question 03

(a) A U-tube manometer contains oil (SG = 0.9), mercury (SG = 13.6) and water as shown in Fig Q3 (a). For the column heights indicated what is the pressure difference between pipes A and B.

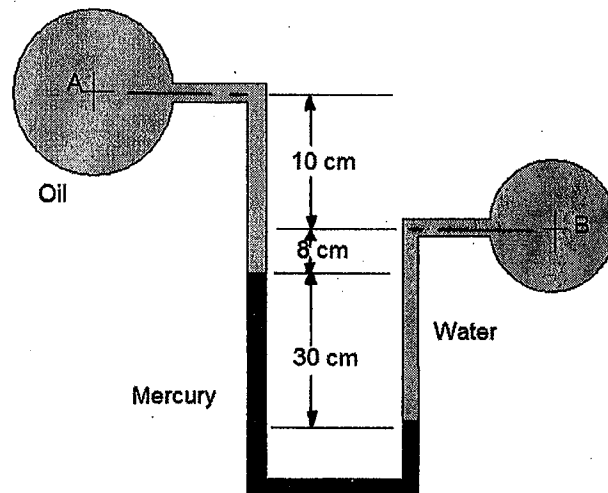


Fig Q3 (a)

(50%)

(b) A pitot-static tube at the centre of a 10 cm diameter pipe is aligned in the direction of flow. When air flows through the pipe, the differential manometer across the pitot tube reads 6 mm of water gauge. It is known that for the air flow under consideration, the centre line velocity is 18 percent higher than the average. Calculate the flow rate of air considering the air density as 1.2 kg/m^3

(50%)

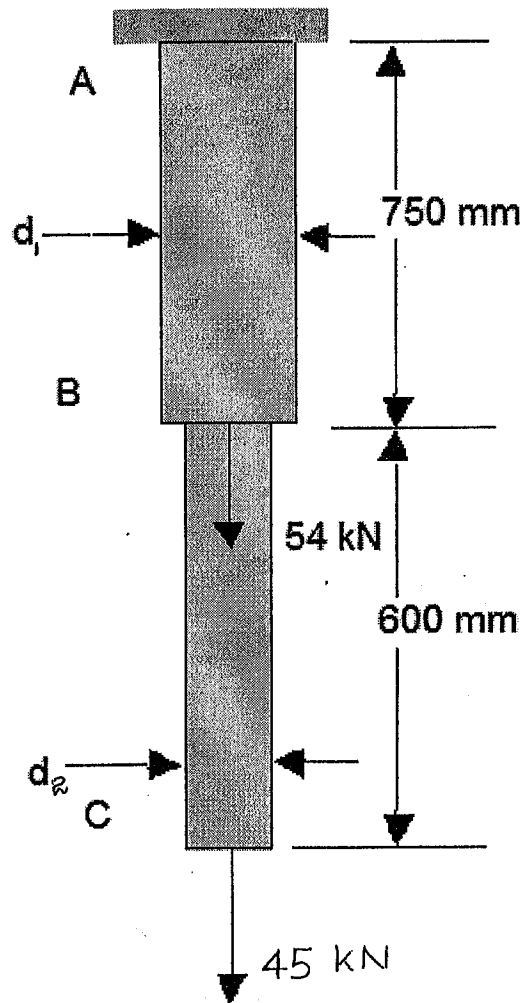
Question 04

(a) Write short notes on the following topics.

- I. Manometers
- II. Bernoulli equation
- III. Pressure prism
- IV. Hooke's law
- V. Factor of Safety

(50%)

(b) Two solid cylindrical rods AB and BC are welded together at B and loaded as shown (Fig Q4 (b)). Knowing that $d_1 = 30$ mm and $d_2 = 20$ mm find the normal stress at the midpoint of (a) rod AB, (b) rod BC.



(50%)

Fig Q4 (b)

