

Navrachana University
School of Liberal Studies and Education
End-Semester Examination November 2017
First Year B.Sc and First Semester
Physics-I and PH-103

Date: 24/11/2017
 Time: 10:30AM to 12:30PM

Marks: 40

Instructions:

- Write each answer on a new page
- Use of a calculator is permitted

Q1. Answer the following in brief: (Any 5)**(5Marks)**

- a) What do you mean by Bulk Modulus of a material?
- b) State the limitations of First law of thermodynamics.
- c) What are reversible and irreversible processes. Give examples of each.
- d) Define Entropy of the system.
- e) State Carnot's Theorem.
- f) State the relation between the elastic constants.

Q2. Answer the following in detail:**(3Marks)**

- a) Internal Energy as a State Function
- b) A load of 6kg is suspended from a ceiling through steel wire of length 20m and radius 2mm. It is found that the length of wire increases by 0.04mm as equilibrium is achieved. Find Young's Modulus of steel. Take $g=3.1\pi \text{ m/s}^2$.

OR

- a) Write a short note on Otto Engine.
- b) A Carnot's engine is operated between two reservoirs at temperatures of 450K and 350K. If the engine receives 1000 calories of heat from the source in each cycle, calculate the amount of heat rejected to the sink in each cycle and work done by the engine in each cycle.
(1 calorie=4.2 joules)

Q3. Derive Mayer's Relation by assuming the internal energy to be a single valued function of state variables(P,V,T).

(5Marks)

Q4. Draw and explain Carnot's Cycle. Also write the work done in each process.

(5Marks)

Q5. The temperature of 5kg of air is raised by 1°C at constant volume. Calculate the increase in its internal energy. (Given $C_p=993 \text{ J Kg}^{-1} \text{ K}^{-1}$, $\gamma=C_p/C_v=5/3$)

(2Marks)

Q6. Answer the following questions in brief:(Any 5)

(5Marks)

- What is inertia ?
- Explain the difference between steady flow and turbulent flow.
- What is work energy theorem?
- What happens to viscosity in fluids with change in temperature ?
- What are non conservative forces? Explain with example.
- Why do dust particle settle on the blades of a fan after running for a long time?

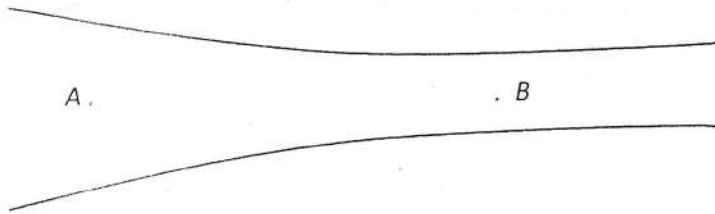
Q7. (a) Explain boundary layer in detail.
(b) Derive equation of viscosity.

(1Marks)

(2Marks)

OR

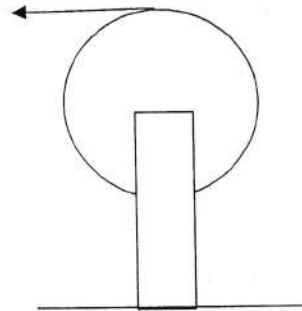
Q7. Liquid of density 1200 kg/m^3 flowing steadily in a tube of varying cross section as is shown. The cross section at a point A is 1.0 cm^2 and that at B is 20 mm^2 , the points A and B are in the same horizontal plane. The speed of the liquid at A is 10 cm/s . Calculate the difference in pressures at A and B. (3Marks)



Q8. (a) Derive poiseulles law.

(3Marks)

(b) A string is wrapped around the rim of a wheel of moment of inertia 0.20 kg m^2 and radius 20 cm . The wheel is free to rotate about its axis. Initially, the wheel is at rest. The string is now pulled by a force of 20 N . Find the angular velocity of the wheel after 5.0 seconds . (2 marks)



Q9.(a) Explain stokes law and derive the equation for the terminal velocity of a smooth spherical grain of radius R having density ρ_s settling through a fluid of density ρ_f . (3 Marks)

(b) Two particles A and B of masses 1 kg and 2 kg respectively are kept 1 m apart and are released to move under mutual attraction. Find the speed of A when that of B is 3.6 cm/hour . What is the separation between the particles at this instant? (2 marks)

Q10. Explain what is the meaning of 'pressure excess' inside the sphere of a liquid of radius r . Explain with necessary equations. (2Marks)

-----Best of Luck-----