

Tribhuvan University

2082 (Regular)

Bachelor Level 4 Yrs. Prog./1st Year/Science & Tech.

(Mechanics, Thermodynamics and Statistical Physics, Electricity & Magnetism)

Full Marks: 100

Physics (PHY.101)

Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt ALL the questions.

1. What do you mean by the N- coupled oscillator? Describe the all-possible modes of oscillations of two particles connected by a spring. [10]

OR

What do you mean by plane progressive wave? Obtain an expression for energy density of a plane progressive wave.

2. What are transport phenomena? Derive an expression for the coefficient of viscosity of a gas on the basis of the kinetic theory of gases. [10]

OR

Discuss Planck's formula for the distribution of energy density in the spectrum of a black body. Show that Wein's law and Rayleigh-Jeans' law are special cases of the formula.

3. Explain displacement current. Obtain the Maxwell's electromagnetic equation and explain on which law they are based. [10]

OR

Derive Clausius-Mossotti relation. What modification was made by Debye? Explain.

4. Obtain Poiseuille's equation using calculus method for the rate of flow of liquid through a capillary tube of uniform bore. [8]
5. Elucidate the meaning of magnetic vector potential. Obtain its expression. [8]

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6. Define Helmholtz's and Gibb's function, and explain the variation of the boiling point of water by changing the atmospheric pressure on the basis of Clausius Claypron's reaction. [8]

7. Solve any TWO questions. [2×3=6]

- Explain with examples the meaning of irrotational vector.
- Clarify the meaning of ensemble
- Illustrate elastic and inelastic collisions with examples
- What is arial velocity? Write the examples of conservation of angular momentum.

8. Answer all the questions. [4×2.5=10]

- State Kepler's laws of panetary motion.
- Define the angle of twist, and find an expression of twisting couple of a wire.
- Explain the meanings of thermal and thermodynamic equilibriums.
- Elucidate energy loss due to Hysteresis.

Calculate the mass of water flowing in 10 minutes through a tube 0.1 cm in diameter 40 cm long, if there is a constant pressure head of 20 cm of water (given η of water = 0.0089 cgs units.) [5]

10. A steel strip is clamped horizontally at one end. On applying a 500 gm load at the free end, the bending in equilibrium state is 5.0 cm. Calculate the potential energy in the strip. [5]

11. A Carnot's engine operates between temperatures 400 K and 600 K. Calculate its efficiency. [5]

12. Four particles are to be distributed in two cells. Calculate the number of micro states. [5]

13. A generator produces current at a frequency of 60 Hz with peak voltage and current amplitudes of 100 V and 10 A respectively. What is the average power produced if they are in phase? [5]

14. A transformer has 330 primary turns and 1240 secondary turns. The input voltage is 120 V and the output current is 15.0 A. What are the output voltage and input current. [5]