Tribhuvan University

2078 (Partial) / 2079 (Regular)

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

Physics (PHY.101) Full Marks: 100

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

(New Course)

Attempt ALL the questions.

1. What is torsional pendulum? Obtain an expression for its time period. Explain why, unlike a simple or a compound pendulum, the time period in this case remains unaffected even if the amplitude be large.

OR [10]

What is cantilever? Obtain an expression for the depression at the free end of a thin light beam champed horizontally at one end and loaded at the other.

2. Define the terms thermal conductivity, thermometric conductivity and temperature gradient. Describe a method for determining the coefficient of thermal conductivity of a bad conductor having the shape of a disc.

OR [10]

State Stefan's law of radiation and explain how it is used to estimate the temperature of Sun's surface. How is Stefan's constant determined?

3. What is electrical dipole? Derive an expression for the electrical potential and electric intensity due to electric dipole.

OR [10]

What do you mean by the terms, hysteresis, residual magnetism of coercive force? Obtain an expression for the energy dissipated per unit volume of the ferromagnetic material during each cycle of magnetization.

4. Derive an expression for the gravitational potential at a point inside and on the surface of a thin spherical shell. [8]

5. Deduce an expression for the change in temperature of a wire thermodynamically when it is structured adiabatically. [8]

6. Explain what do you mean by magnetic vector potential. Obtain expression for it. [8]

7. Solve any TWO questions [2×3=6]

   a) Explain the principle of regenerative cooling.
   b) What do you mean by radius of gyration?
   c) How does viscosity vary with temperature?
   d) Distinguish between polarization vector & displacement vector.

8. Solve all the questions [4×2.5=10]

   a) How & why the concept of displacement current was introduced?
   b) Why is the chock coil considered superior to a rheostat in a.c., circuit?
   c) What is importance of clausius - clapeyron latent heat equation?
   d) What do you mean by geo-stationary satellite?

9. A uniform solid sphere of mass 20 kg and radius 5 cm makes 5 revolutions per second about a tangent. What are the moment of inertia and angular momentum about this axis? [5]

10. Calculate the tensile stress in a wire of density 8.0 g/cm^3 when the velocity of transverse waves on it is equal to 340 m/s (the velocity of sound in air). $V = \sqrt{\frac{T}{\mu}}$ [5]

11. Calculate the change in entropy when 10 g of steam at 100^{0}C cools to water at 0^{0}C, assuming that the latent heat of steam is 538 cal/g and specific heat of water 1 cal/g. [5]

12. Find the temperature at which the *r.m.s* speed of hydrogen molecule is equal to that of nitrogen molecule at 77^{0}C. [5]

13. Estimate the drift velocity of electrons in a copper wire of diameter 1 mm, carrying a current of 0.1 A. [5]

14. A 110V, 100 W lamp is to be run at 220V, 53 cycle mains. Calculate the inductance of the choke to be placed by series with the lamp? [5]

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P.T.O.