

FIRST YEAR B.Sc. DEGREE EXAMINATION, APRIL/MAY 2005**Part III—Physics Subsidiary****Paper I—MECHANICS, PROPERTIES OF MATTER AND THERMAL PHYSICS****(For Home Science Main)****(2003 Admissions)****Time : Three Hours****Maximum : 50 Marks****Section A**

*Answer any two questions.
Each question carries 7 marks.*

1. Derive the expression for moment of inertia of a uniform annular disc about an axis through its centre perpendicular to its plane.
2. What is a compound pendulum. How will you determine 'g' using a compound pendulum.
3. Explain with theory the experiment to determine Young's modulus by uniform bending.
4. How will you determine the thermal conductivity of a bad conductor by Zees Disc Method ?
(2 × 7 = 14 marks)

Section B

*Answer any twelve questions.
Each question carries 2 marks.*

5. State and prove parallel axes theorem.
6. Derive the expression for K.E. of a rotating body.
7. Define simple harmonic motion and write down the differential equation for simple harmonic motion.
8. Define the three moduli of elasticity and Poisson's ratio.
9. Obtain the expression for excess pressure on a curved surface.
10. What are the limitations of Poiseuille's formula ?
11. State and explain Graham's law of diffusion.
12. What are the laws of Osmosis ?
13. What is meant by Barton's correction in calorimeter experiments ?
14. What is meant by Boyle temperature ?
15. Mention the properties of liquid helium I.
16. Derive the expression for work done in adiabatic process.
17. Write down Kelvin's and Clausius statements of second law of thermodynamics.

18. Draw P-V diagram for petrol engine.
19. Write down Van der waals reduced equation of state.
20. Explain the relation between entropy and disorder.
21. What is meant by thermal conductivity ?
22. Explain the distribution of energy in black body spectrum.
23. Moment of inertia of a solid sphere about a diameter is 40Kgm^2 . What is its moment of inertia about a tangent.
24. Explain thermodynamic scale of temperature.

(12 × 2 = 24 marks)

Section C

*Answer any four questions.
Each question carries 3 marks.*

25. A Flywheel of mass 400 Kg and 1m radius makes 600 rotations in one minute. Assuming its mass to be concentrated at the rim, calculate angular velocity, moment of inertia and rotational K.E.
26. Sound waves of frequency 512 Hz and amplitude 10^{-4}m travel through air with a speed 332ms^{-1} . Calculate intensity of waves if density of air is 1.29Kg m^{-3} .
27. A disc of radius 0.1m weighing 1kg is suspended in a horizontal plane by a vertical wire 1.5 m long attached to its centre. If diameter of wire is 10^{-3}m and period of torsional oscillations is 5 sec, calculate rigidity modulus of material of wire.
28. A small drop of water kept pressed between two glass plates spreads as a circle of diameter 10 cm. If distance between plates is 0.005 mm, and surface tension of water is 0.0752Nm^{-1} , what force will be required to separate the plates.
29. Water is flowing through a horizontal tube of length 0.25 m and radius $4 \times 10^{-4}\text{m}$ under a constant pressure head of 0.2m of water at the rate of $5 \times 10^{-6}\text{m}^3$ per minute. Calculate coefficient of viscosity of water. Density of water = 1000Kgm^{-3} .
30. The efficiency of a Carnot cycle is 1/6 by lowering the temperature of sink by 65K the efficiency increases to 1/3. Calculate initial temperature of sink.
31. Calculate the change in entropy when 1Kg of ice at its melting point is converted into water and heated to 283K. Latent heat of ice = $3.35 \times 10^5\text{JKg}^{-1}$. Specific heat capacity of water = $4180\text{JKg}^{-1}\text{K}^{-1}$.

(4 × 3 = 12 marks)