

Reg. No

Name

22U145

B.Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022

SEMESTER 1 : COMPLEMENTARY PHYSICS FOR B. Sc MATHEMATICS

COURSE : 19U1CPPHY1 : PROPERTIES OF MATTER AND ERROR ANALYSIS

(For Regular – 2022 Admission and Improvement / Supplementary - 2021/2020/2019 Admissions)

Time : Three Hours

Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Define the term "Surface Tension". Give its unit.
2. How three types of moduli of elasticity arise?
3. Write down the relative error in $P(x)$ if $P=x^n$ (where n is an integer)
4. What is torsion pendulum? Why it is called so?
5. Write down the relative error in $P(\alpha)$ if $P=\cos(\alpha)$
6. Name the forms of energy possessed by a liquid undergoing a streamline flow through a pipe.
7. Differentiate between cohesive and adhesive force.
8. What is meant by the term Brownian motion?
9. Write down the expression for a normal distribution function, express the terms involved.
10. Distinguish between yield point and breaking point.

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. A car travels at a speed of (100 ± 5) km/hr for $t = (3.2 \pm 0.1)$ hr. Calculate the relative error in the distance travelled.
12. A metal disc having mass 1 kg and radius 0.1 m is suspended as a torsional pendulum using a wire of length 1 m and radius 0.5×10^{-3} m. If the period of torsional oscillation is 4 seconds, find the rigidity modulus of the wire?
13. What is the excess pressure inside a drop of liquid of 3mm radius at a room temperature. Given surface tension of the liquid at the same as 4.7×10^{-1} N/m.
14. The pressure inside a soap bubble of radius 2 cm is balanced by a liquid (density 800 Kg/m^3) column of height 0.72 mm. Determine the surface tension of the soap solution.
15. A bar 1 m in length and 5×10^{-8} m² square in cross section is supported horizontally at its ends and loaded at the centre. The depression produced by 0.1 kg at the centre is 1.96×10^{-3} m. Find the Young's modulus of the material of the bar.
16. Two resistors $R_1 = (100 \pm 3)$ Ohm and $R_2 = (200 \pm 4)$ Ohm are connected in series and parallel. Determine the equivalent resistance in each case.

17. Describe an experiment to determine the Young's modulus of the material of a rectangular scale by uniform bending
18. A Student measures acceleration due to gravity (g) by measuring the time 't' for a stone to fall from a height 'h' above the ground. After taking several readings he obtains $t = (1.6 \pm 0.1)$ sec and $h = (46.2 \pm 0.3)$ feet. What is the answer in 'g' presented as $g_{\text{best}} \pm dg$?

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Describe with theory an experiment to determine the Y of a bar having rectangular cross section by uniform bending.
20. Obtain an equation for couple per unit twist when a cylindrical rod fixed at one end and given a twist at the other end.
21. Discuss the rules adopted in calculating the error when the numbers with errors are (a) multiplied (b) divided (c) raised to some power. Estimate the value of q , if $q = \left(\frac{x}{y}\right) + (x + y)$, where $x = (4.0 \pm 1)$ and $y = (10.0 \pm 0.5)$
22. Discuss a setup to measure the surface tension of water in lab using capillary rise approach. Arrive at a formula and ways of measuring various parameters.

(10 x 2 = 20)