

NE-856 Seat No. _____
First Year B. Sc. (Fire Technology) Examination
April / May – 2003
Applied Physics

Time : Hours]

[Total Marks : **70**

- Instructions :** (1) All questions are **compulsory**.
(2) Figures to the right indicate full marks of the question.
(3) Non-programmable scientific calculators are permitted.
(4) Assume suitable additional data that may be necessary.

- 1** (a) How should a unit be ? **4**
(b) Give dimensional formulae for : **3**
(i) Linear momentum
(ii) Stress
(iii) Surface energy.
(c) If the velocity of water waves depends on the **3**
wavelength λ , density of water ρ and acceleration
due to gravity g . Then using dimensional analysis,
prove that $v \propto \sqrt{\lambda g}$.
(d) Answer the following in brief : **4**
(1) Can a body have zero mass and zero weight ?
(2) Explain the meaning of giga, micro and femto.
(3) Write dimensional formula of angle.
(4) Convert 10 m/s velocity into km/hr.

OR

- 1 (a) Give statement of Newton's law of viscosity. Explain variation of viscosity with temperature. 5
- (b) Define : Kinematic viscosity and obtain its unit in MKS system. 2
- (c) Define : any **two** : 4
- (i) Density
- (ii) Specific weight
- (iii) Specific volume.
- (d) A plate placed at 0.025 mm distant from a fixed plate moves with a velocity of 60 cm/s and to maintain this velocity a force of 2 N/m² is required. Determine the fluid viscosity between the plates. 3
- 2 (a) Define : 'Gravitational potential' and prove that 4
- $$V = -\frac{GM}{R}$$
- where M = mass of earth and R = radius of earth.
- (b) Radius of the earth is 6400 kms. Its mean density is 6×10^3 kg/m³. Calculate earth's gravitational potential. 4
- (c) Write a brief note on satellites. Derive expressions for orbital velocity and time period of a satellite. 4
- (d) Mention different sources of error in the measurement of g . 2

OR

- 2 (a) What do you understand by the term stress ? Explain briefly different types of stress. 6
- (b) Define : any **two** 4
- (i) Deforming force
- (ii) Perfectly elastic body
- (iii) Elasticity.
- (c) Explain : Different types of solids. Give three characteristics of each. 4

- 3 (a) Give statement of Stoke's law and derive expression for the terminal velocity of a small spherical body moving through a viscous medium. **6**
- (b) Calculate the height (h) upto which water will rise in a capillary tube of diameter 2 mm. Angle of contact for water is zero and surface tension of water (T) is 0.072 N/m. **4**
- (c) Prove that Reynold's number is dimensionless. **2**
- (d) Explain in brief : Equation of continuity. **2**

OR

- 3 (a) Explain Jaeger's method for the determination of surface tension of a liquid. **6**
- (b) Explain : Surface tension and surface energy of a liquid. **4**
- (c) For a liquid drop prove that $P_i - P_o = \frac{2T}{R}$ (symbols have their usual meanings) **4**

- 4 (a) Derive Bernoullie's equation. **6**
- (b) Explain the physical quantity : Discharge (Q) of a fluid. **4**
- (c) Explain : Stream lines and laminar fluid. **2**
- (d) Explain : Buoyanacy. **2**

OR

- 4 (a) Derive : Euler's equation of motion. **7**
- (b) Explain : Metacentre. **3**
- (c) Explain : Stable, unstable and neutral equilibrium for a submerged body. **4**
- 5 (a) Explain : Radioactivity. **4**
- (b) Write properties of β -rays. **4**
- (c) Explain : radioactive constant λ . **4**
- (d) Write definition of (1) curie (2) Bequerral. **2**

OR

- 5 (a) Explain any **two** of the following : **4**
- (i) Symbol : $Z^X A$
 - (ii) Isotopes
 - (iii) Isomers.
- (b) Explain : construction, principle and working of a **6**
Coolidge tube.
- (c) If a X-ray tube is operated at 50,000 volts, then **4**
calculate the shortest wavelength of the X-rays
provided by this tube. (Take $h = 6.6 \times 10^{-34}$ J.second,
 $C = 3 \times 10^8$ m/sec, $e = 1.6 \times 10^{-19}$ Coloumb)
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