AV–1666

B.Sc. (Part—I) Semester—I Examination
1S : PHYSICS
(Mechanics, Properties of Matter, Waves and Oscillations)

Time : Three Hours]　　　　　　　　　　　　　　　　　　　　[Maximum Marks : 80

N.B. :— (1) **All** questions are compulsory.

(2) Draw neat diagrams wherever necessary.

1. (A) Fill in the blanks :

　　(i) SI unit of surface tension is _____ .

　　(ii) Linear momentum is _____ quantity.

　　(iii) Within elastic limit, stress is directly proportional to _____ .

　　(iv) The fundamental frequency is called _____ harmonics.　　　　　2

　(B) Choose correct alternative :

　　(i) The intensity of gravitational field of the earth is maximum at :

　　　　(a) Centre of Earth　　　　　　(b) Equator

　　　　(c) Poles　　　　　　　　　　　(d) Same everywhere

　　(ii) At resonance, the amplitude of oscillation is :

　　　　(a) Minimum　　　　　　　　　(b) Maximum

　　　　(c) Zero　　　　　　　　　　　(d) Varying with time

　　(iii) Velocity of standing wave is :

　　　　(a) Zero　　　　　　　　　　　(b) Maximum

　　　　(c) Minimum　　　　　　　　　(d) None of these

　　(iv) Young's modulus of elasticity is related with change in :

　　　　(a) Volume　　　　　　　　　　(b) Shape

　　　　(c) Length　　　　　　　　　　(d) None of these　　　　　2

　(C) Answer in **one** sentence each :

　　(i) What is viscus drag ?

　　(ii) What is elastic limit ?

　　(iii) Define Universal Gravitational Constant.

　　(iv) Define Moment of Inertia.　　　　　　　　　　　　　　4

EITHER

2. (A) State and explain Newton's law of gravitation.　　　　　　　3

　(B) State and prove Gauss theorem in gravitation.　　　　　　　3

　(C) Obtain an expression for gravitational potential due to spherical shell at a point outside the shell.　　　　　　　　　　　　　　　　　　6

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OR

3. (P) State and prove Kepler's Second Law of Planetary motion. 4

(Q) Define acceleration due to gravity, obtain its value at height 'h' above the earth surface. 4

(R) Derive an expression for a gravitational potential and intensity due to uniform solid sphere at a point outside the sphere. 4

EITHER

4. (A) Derive an expression for the moment of inertia of a disc about an axis passing through its centre and perpendicular to its plane. 5

(B) State and prove theorem of perpendicular axes. 5

(C) A solid cylinder of mass 30 kg rotates about its axis with radius 30 cm. What will be the M.I. about its axis. 2

OR

5. (P) State and prove law of conservation of linear momentum. 4

(Q) Derive an expression for moment of inertia of solid sphere about its diameter. 6

(R) State the analogy between translational and rotational motion. 2

EITHER

6. (A) How Keter's reversible pendulum is used to determine the acceleration due to gravity at a given place ? 6

(B) Define Linear S.H.M., derive the expression for displacement, velocity and acceleration. 6

OR

7. (P) Define Compound Pendulum and obtain an expression for the periodic time of compound pendulum. 6

(Q) Derive an expression for total energy of harmonic oscillator. Show that it is conserved. 6

EITHER

8. (A) What is Piezoelectric effect ? How can the ultrasonic waves be produced by using Piezoelectric crystal oscillator ? 6

(B) Give medical and industrial applications of ultrasonic waves. 4

(C) What are harmonics and overtones ? 2

OR

9. (P) Derive an expression for velocity of transverse wave along stretched string. 5

(Q) Explain the formation of standing waves when two waves of equal amplitude and wavelength travels in opposite direction along the same line. 5

(R) What are Lissajous Figures ? 2

EITHER

10. (A) How the modulus of rigidity of material of a given wire can be determined by Torsional Pendulum. 6

(B) Derive an expression for twisting couple per unit twist for cylindrical wire. 6

OR

11. (P) Define :

    (i)   Young's modulus

    (ii) Bulk modulus

    (iii) Modulus of rigidity.   3

    (Q) Explain the terms :

    (i)   Angle of twist

    (ii) Angle of shear.   3

    (R) Derive an expression for depression of a beam supported at two ends and loaded in the middle.   6

EITHER

12. (A) Explain surface tension on the basis of molecular theory.   4

    (B) State Stoke's Law.   2

    (C) State and prove Bernoulli's theorem.   6

OR

13. (P) What is Reynold's number ? Give its physical significance.   3

    (Q) Define surface energy and show that the surface tension is equal to potential energy per unit area.   3

    (R) Derive Poiseuille's equation for rate of flow of liquid.   6