AT – 268

First Semester B. Sc. (Part – I) Examination

PHYSICS

(Mechanics, Properties of Matter, Waves and Oscillation)

P. Pages : 7

Time : Three Hours] | Max. Marks : 80

Note : (1)   All questions are compulsory.

(2)   Draw suitable and neat diagram wherever necessary.

1.   (a)   Fill in the blanks :—

(i)   According to Kepler's second law, _____ of the planet remains constant.

(ii)   S.I. unit of Angular momentum is _____.

(iii)   Young's modulus is a property of _____ only.

(iv)   The flow of liquid remains streamline, as long as its velocity is less than the _____.   2

AT – 268   P.T.O.

(B) Choose the correct alternative :—

(i) Volume of liquid flowing per second through a cylindrical narrow tube is given by

    (a) Stoke's law

    (b) Poiseuille's equation

    (c) Bernoulli's theorem

    (d) Jaeger's method

(ii) Modulus of rigidity is related with change in

    (a) Volume

    (b) Shape

    (c) Length

    (d) None of these

(iii) When sound wave travels through medium then according to Laplace the process is

    (a) Isothermal

    (b) Adiabatic

    (c) Isobaric

    (d) Isochoric

AT – 268   2

(iv) The intensity of gravitational field of the earth is maximum at _____.

    (a) Centre of earth

    (b) Equator

    (c) Poles

    (d) Same every where   2

(C) Answer in **One** sentence :—

    (i) What are ultrasonics waves ?

    (ii) What is compound pendulum ?

    (iii) Define gravitational potential.

    (iv) What is Cantilever ?   4

EITHER

2. (a) Derive an expression for gravitational potential due to uniform solid sphere at a point inside the sphere.   6

    (b) State and prove Kepler's second law of planetary motion.   6

OR

3. (p) Define gravitational constant. Give its S.I. unit and dimensions.   3

(q) Derive an expression for gravitational potential due to a solid sphere at a point outside the sphere. 6

(r) Discuss the variation of acceleration due to gravity with the depth. 3

EITHER

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

(b) State and prove law of conservation of angular momentum. 4

(c) What is moment of Inertia ? State its S.I. unit. 2

OR

5. (p) State and prove theorem of perpendicular axes. 6

(q) Obtain moment of inertia of disc about an axis passing through its centre and perpendicular to its plane. 6

EITHER

6. (a) How Kater's reversible pendulum is used to determine the acceleration due to gravity ? Explain. 6

AT – 268   4

(b) Obtain differential equation for a damped harmonic oscillations. 3

(c) Show that the vibration of bar magnet in uniform magnetic field is angular S.H.M.

3

OR

7. (p) Derive an expression for the periodic time of compound pendulum. 6

(q) Derive an expression for the total energy of particle performing S.H.M. 4

(r) What is simple pendulum ? 2

EITHER

8. (a) Describe construction and working of Kundt's tube. 6

(b) Explain propagation of transverse waves in the stretched string. 6

OR

9. (p) Explain production of ultrasonic waves by magnetostriction oscillator. 6

(q) Explain Laplace correction. 4

AT–268 5 P.T.O.

(r) State any four applications of ultrasonic waves in medical field. 2

EITHER

10. (a) Explain how the modulus of rigidity of the material of wire can be determined by Maxwell's needle. 6

(b) Discuss external bending moment of a beam. 3

(c) A Cantilever of breadth and depth 0·01 m and 1 m long is clamped horizontally at one end. When load of 1 kg is applied to free end, the depression of free end is 4×10^{-2} m. Calculate Young's modulus of the material of the cantilever by taking $g = 9.8 \, m/s^2$. 3

OR

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

(q) Explain :

(i) Angle of twist.

(ii) Angle of shear. 4

(r) What is elastic limit ? 2

AT –268 6

EITHER

12. (a) Derive an equation of continuity. 6

   (b) Show that the surface tension is equal to potential energy per unit area. 4

   (c) Distinguish between streamline and turbulent flow of liquid. 2

OR

13. (p) Explain how to Determine the surface tension of liquid by Jaeger's method. 6

   (q) Explain the terms :

     (i) Viscosity.

     (ii) Coefficient of viscosity. 4

   (r) Give SI unit and dimensions of surface tension. 2

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