OR

13. (P) State and prove Bernoulli's theorem. 6

(Q) Derive an equation of continuity. 3

(R) Define angle of contact. On what factors it depends ? 3

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

1S : PHYSICS

(Mechanics, Properties of Matter, Waves and Oscillations)

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) All questions are compulsory.
(2) Draw neat diagrams wherever necessary.

1. (A) Fill in the blanks :— .

(i) Kepler's ———law is known as law of areal velocity.

(ii) SI Unit of angular momentum is———— .

(iii) Damping force is directly proportional to ——— .

(iv) Young's modulus is a property of —— —— only. 2

(B) Choose correct alternative :

(i) The moment of momentum is called

(a) Couple

(b) Torque

(c) Angular momentum

(d) Impulse.

(ii) Spring and mass system executes.

(a) Linear S.H.M

(b) Angular S.H.M

(c) Both (a) and (b)

(d) None of the above.

(iii) S.I. unit of surface tension is

(a) Dynes / cm

(b) Dynes / cm^2

(c) Newton / meter

(d) Newton / $meter^2$.

(iv) Bulk modulus of elasticity is related with change in

(a) Volume

(b) Length

(c) Shape

(d) None of these. 2

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

(i) Define radius of gyration.

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

(C) Define :—

(i) Modulus of rigidity

(ii) Modulus of elasticity. 2

OR

11. (P) Derive an expression for depression of a beam supported at two ends and centrally loaded. 6

(Q) Explain internal bending moment and external bending moment. 6

EITHER

12. (A) Explain how the surface tension of liquid can be determined by Jaeger's method. 6

(B) Distinguish between streamline and turbulent flow. 4

(C) Define coefficient of viscosity. State its S.I. unit. 2

EITHER

8. (A) Describe construction and working of Kundt's tube. 4

(B) Derive Newton's formula for velocity of sound in air. 4

(C) What are ultrasonic waves ? State its industrial and Medical applications. 4

OR

9. (P) Obtain an expression of resultant displacement and amplitude due to superposition of two SHM along a same line. 5

(Q) Explain with neat labeled diagram Piezo–electric generator for the production of the ultrasonic waves. 5

(R) What are the necessary conditions for interference of sound waves. 2

EITHER

10. (A) Explain :—

(i) Angle of twist

(ii) Angle of shear 4

(ii) State Hooke's law of elasticity.

(iii) What is simple pendulum ?

(iv) Define angle of contact. 4

EITHER

2. (A) State and prove Kepler's third law of planetary motion. 4

(B) Discuss variation of acceleration due to gravity with :

(i) The altitude

(ii) The depth. 6

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

OR

3. (P) Derive an expression for gravitational potential and Intensity due to solid sphere at a point inside the solid sphere. 6

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

(R) Define :—

(i) Gravitational potential

(ii) Gravitational field Intensity

(iii) Gravitational field. 3

EITHER

4. (A) State and prove theorem of parallel axes. 5

(B) Derive an expression for the M.I. of solid cylinder about an axis passing through its centre and perpendicular to its length. 5

(C) Calculate the M. I. of disc about the transverse axis through centre of disc whose radius is 10 cm and mass 49.2 kg. 2

OR

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

(Q) Derive an expression for M. I. of solid sphere about its diameter. 5

(R) Find the M.I. of thin circular disc about an axis passing through it center and perpendicular to its plane. 3

EITHER

6. (A) State differential equation of S.H.M. Obtain an expression for the acceleration, velocity and displacement. 6

(B) Show that angular acceleration is directly proportional to the displacement in case of compound pendulum, also find its periodic time. 6

OR

7. (P) Obtain an expression for K.E. and P. E. of particle performing S.H.M. and discuss the variation of K.E. and P.E. with displacement. 6

(Q) Explain :

(i) Damped oscillation

(ii) Forced oscillation

(iii) Resonance. 3

(R) Obtain the differential equation for damped harmonic oscillations. 3