B.Sc. DEGREE EXAMINATION NOVEMBER 2017.

First Semester

PHYSICS (Optional)

Time : Three hours   Maximum : 80 marks

Answer the questions 1 to 4 in the first page of the answer book.

Scientific calculators are allowed.

PART I – (10 × 2 = 20 marks)

Answer any **TEN** of the following questions.

1. The frame of reference attached to the earth is

    (a)   an inertial frame   (b)   non-inertial frame

    (c)   both (a) and (b)   (d)   none of these

2. Dimensional formula for linear momentum is

    (a) $[M^1L^1T^1]$ (b) $[M^0L^1T^{-1}]$

    (c) $[MLT^{-1}]$ (d) $[M^{-1}L^{-1}T]$

3. If $k = l$ the period of compound pendulum is

    (a)   maximum   (b)   minimum

    (c)   either (a) and (b)   (d)   none of these

4. Expression for the excess of pressure in a soap bubble is given by

    (a) $P = \dfrac{T}{r}$ (b) $P = \dfrac{2T}{r}$

    (c) $P = \dfrac{3T}{r}$ (d) $P = \dfrac{4T}{r}$

5. What is fictitious force?

6. Define angular momentum. Give an expression for angular momentum interms of angular velocity of the body.

7. Define Poisson's ratio and write the expression for it.

8. Explain the term molecular range and sphere of influence.

9. Write any two differences between streamline and turbulent flow.

10. A 100 gm stone is revolved at the end of 50 cm long string at the rate of 2 revolutions per second. What is its angular momentum?

11. A particle executing SHM of amplitude 4 cm and time period of 4 seconds. Calculate its velocity at the mean position.

12. Calculate the modulus of rigidity of steel wire having Young's modulus 6×10^{10} Nm^{-2} and Bulk modulus 2×10^{10} Nm^{-2}.

PART II – (6 × 5 = 30 marks)

Answer any SIX of the following.

13. State the law of conservation of momentum and show that it is invariant under Galilean transformation.

14. Discuss the inelastic collision between two particles in the laboratory frame of reference.

15. State and prove the perpendicular axis theorem.

16. Derive the expression for Bulk modulus of the cube.

17. Give the theory of Jeager's method of determining the surface tension of a liquid.

18. Two particles of masses 2 kg and 3 kg are at the points (3, 2, – 1) and (–2, 2, 4) respectively in a plane. Find the position of centre of mass.

19. A flywheel of mass 15 kg and diameter 0.6 meter makes 8 rotations per second. Assuming the mass to be concentrated at the rim. Calculate the energy of the flywheel. https://www.karnatakastudy.com

20. Find the work done in stretching a wire 1 square mm cross-section and 2 m long through 0.1 mm. Young's modulus $Y = 2 \times 10^{11}$ Nm^{-2}.

PART III – (3 × 10 = 30 marks)

Answer the following questions.

21. (a) (i) What is a central force? Write characteristics of central force.

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

<div align="center">Or</div>

  (b) (i) What are Lissagous figures?

    (ii) Obtain an expression for composition of two liner SHMs of equal periods acting at right angles to each other.

22. (a) Determine the moment of inertia of a circular disc

    (i)   about an axis passing through its centre and perpendicular its plane

    (ii)   about the diameter

    (iii) about the tangent.

Or

(b) (i)   Describe an experiment to determine the acceleration due to gravity using bar pendulum.

    (ii)   Obtain an expression for the excess pressure inside a liquid drop.

23. (a) What is a cantilever? Obtain an expression for depression produced at free-loaded end of a light cantilever.

Or

(b) What is viscosity? With relevant theory, describe Stoke's method of determining coefficient of viscosity of a liquid.