1B1N22304 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Physics Degree Examination, November 2022

BPH1B01 – Mechanics – I

(2022 Admission onwards)

Time : 2 hours Max. Marks : 60

The symbols used in this question paper have their usual meanings.

Section A- short Answer type

(Answer all questions. Each question carries a maximum of 2 marks.)

1. Distinguish between inertial and non-inertial frames of reference.
2. Give the operational definition of mass.
3. A block 'A' is kept above the block 'B' and B is kept on a table. Draw the force diagrams for the block A and block B.
4. Define centre of mass of a system of particles.
5. Obtain an expression for coefficient of friction in terms of the angle of inclination of the surface.
6. A mass m is thrown vertically upward with initial velocity v_0. How high will it rise? Assume that the gravitational force is constant.
7. What is a central force? Obtain the expression for the work done by a central force.
8. Using the energy diagram, explain the bound and unbound states of a diatomic system.
9. Give mathematical expression for areal velocity, explain the terms.
10. What is the relation between torque and angular acceleration?
11. Give the relation connecting linear velocity and angular velocity. Explain the terms.
12. State and explain the law of conservation of angular momentum.

(Ceiling: 20)

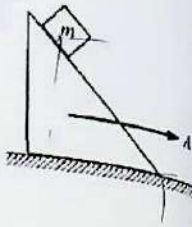
Section B

Paragraph/Problem Type

(Answer all questions. Each correct answer carries a maximum of 5 marks.)

13. What are the limitations of Newton's laws?

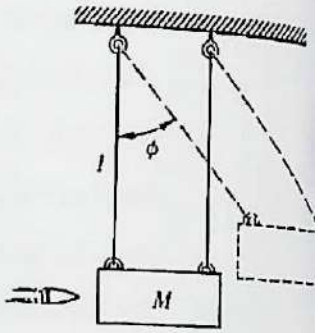
14. A 45° wedge is pushed along the surface of a table with constant acceleration "A" on the horizontal plane. A block of mass m slides without friction on the wedge as shown in the figure. Find its acceleration.



15. Using work- energy theorem, obtain the escape velocity when an object is projected at an angle θ from the vertical.

16. Determine whether the force $F=(2xy+z^2)\hat{\imath}+(x^2)\hat{\jmath}+(3xz^2)\hat{k}$ is conservative or not.

17. A wooden block of mass M, suspended from cable of length *l* is hit by a bullet. The impact of the bullet causes it to swing through a maximum angle φ, as shown in the figure. The initial speed of the bullet is *v*, and its mass is m. (a) How fast is the block moving immediately after the bullet comes to rest? (b) Show how to find the velocity of the bullet by measuring m, M, *l* and φ.



18. Find the moment of inertia of a thin sheet of mass M in the shape of an equilateral triangle about an axis through a vertex, perpendicular to the sheet. The length of each side is L.

19. Obtain an expression for the acceleration for an Atwood's machine with a massive pulley.

(Ceiling: 30)

Section C

(Answer any one question. Answer carries 10 marks)

20. (a) Explain tension on a string from the microscopic point of view. For a rope of mass M and length L hanging freely, is the tension uniform throughout? Explain.

(b) A uniform rope of mass M and length L is pivoted at one end and whirls with uniform angular velocity ω on a horizontal plane. What is the tension in the rope at a distance 'r' from the pivot?

21. (a) Derive the general work-energy theorem for a rigid body.

(b) Consider a uniform drum of radius b, mass M and moment of inertia $I=\frac{Mb^2}{2}$ on an inclined plane of angle β. If the drum starts from rest and rolls without slipping, find the speed of its centre of mass after it has descended a height h.

(1x10= 10 marks)

1B1N22305 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2022

BPH1C01 – Properties of Matter & Thermodynamics

(2022 Admission onwards)

Time : 2 hours Max. Marks : 60

Section A- Short Answer Type

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks, Overall Ceiling 20)

1. Write any two relations connecting elastic constants.
2. Define Poisson's ratio. What are its limiting values?
3. Define bending moment.
4. Define surface Tension with examples.
5. What are the SI and CGS units of coefficient of viscosity.
6. What is Brownian motion?
7. How viscosity of gases vary with temperature?
8. What is a quasistatic process ?
9. What are the limitations of first law of thermodynamics?
10. When do you say a process is reversible?
11. Absolute entropy of a system cannot be determined, only the change in entropy can be calculated- Explain
12. What is principle of degradation of energy?

(Ceiling-20)

Section B- Paragraph/ Problem Type

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. Derive an expression for work done per unit volume in deforming a body in the case of volume strain.
14. There is no change in volume of a wire on sretching. Show that its Poisson's ratio is 0.5

15. A cantilever of length 50cm is depressed by 15mm at the loaded end.Calculate the depression at a distance 30cm from the fixed end.

16. Derive an expression for work done in forming a big drop of water (Surface Tension S) from n small drops.

17. A Carnot engine working between two temperatures has the efficiency of 0.4. If the temperature of source is increased by 100^0C, the efficiency increases to 0.5. Find the temperature of source and sink.

18. 0.5 Kg of water at 40^0C is mixed with 1 Kg of water at 10^0C. Calculate the change in entropy of the system.

19. Find the decrease in the melting point of ice when the pressure is increased by 1 atm. Latent heat of fusion is 80 Cal/gm. Change in the specific volume is 0.05×10^{-3} m^3/Kg.

(Ceiling- 30)

Section C- Essay Type

Answer any one question. Answer carries 10 marks

20. Derive an expression for the rate of flow of liquid through a capillary tube.

21. What is entropy? Write its physical significance. Explain the entropy changes in reversible and irreversible processes and show that entropy of universe is always increasing.

(1 x 10= 10 Marks)