2B1N23304

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Physics Degree Examination, November 2023

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 in two or three sentences, each correct answer carries a maximum of 2 marks.)

1. Consider a sliding block on moving wedge. Draw the force diagram.
2. State Coulombs law of electrostatic forces.
3. How the apparent weight and actual weight of a person standing on a weighing machine inside the elevator is related when the elevator is accelerating upwards?
4. Give a brief account on tension force on the string.
5. Draw the trajectory of centre of mass, when the drum major's baton is thrown in air.
6. How do the value of acceleration due to gravity varies in poles and equator?
7. What are time independent forces? Give examples.
8. State work energy theorem in one dimension.
9. Define power. What is its unit?
10. Show that the time rate of change of angular momentum of a particle is equal to torque acting on it.
11. Write the expression for moment of inertia of a disk about an axis at the rim, perpendicular to the plane.
12. Explain conservation of angular momentum with an example.

(Ceiling: 20 Marks)

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. Explain how multiple pulley system can be used to easily raise heavy loads.
14. What is a spring gun? Derive an expression for maximum velocity of a ball shot from a spring gun, in terms of spring constant k.
15. Show that in a freight train, the force on each compartment is proportional to the number of compartments pulled.
16. Derive an expression for escape velocity. Calculate escape velocity from the moon.(Mass of the moon= 7.34×10^{22}kg, Radius of the moon = 1.74×10^{6}m)
17. Determine whether the following two forces are conservative or not:
    (a) $\mathbf{F} = 4xy\boldsymbol{i} + x^2\boldsymbol{j} + (3xz^2 + z^2)\,\boldsymbol{k}$
    (b) $\mathbf{F} = yz\,\boldsymbol{i} + zx\,\boldsymbol{j} + xy\,\boldsymbol{k}$
18. Obtain an expression for acceleration for an Atwood's machine.
19. Four particles A, B, C, D of masses m, 2m, 3m and 4m respectively are kept at the corners of a square ABCD of side 'a', where A is at the origin and sides AB and AD coincide with the X and Y axes. Locate the centre of mass.

(Ceiling: 30 Marks)

Section C-Essay Type

(Answer any one question. Answer carries 10 marks)

20.(a)Explain linear restoring force. Discuss the nature of restoring force when a spring is stretched and compressed.

(b)Derive the equation of simple harmonic motion for linear harmonic oscillator and find its solution.

21. Discuss the motion of particle in a central force field. Show that for central force motion the angular momentum is conserved and hence the areal velocity remains constant.

($1 \times 10 = 10$ Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2023

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. Mention any one application of Poisson's ratio.
2. What is yield point?
3. What is flexural rigidity?
4. What is geometrical moment of inertia?
5. Give some examples for surface tension phenomenon.
6. Explain the effect of impurities on surface tension.
7. What are the SI and CGS units of coefficient of viscosity.
8. An ideal gas at 1 atm is slowly compressed to $\frac{1}{8}$ of its initial volume. Find the resulting pressure
9. What are the significances of first law of thermodynamics?
10. State the Kelvin-Planck statement of second law of thermodynamics
11. Absolute entropy of a system cannot be determined. Only the change in entropy can be calculated- Explain
12. Explain the effect of pressure on boiling point of water.

(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. Calculate the force required to stretch a 2cm diameter steel rod by 0.01 percentage. Young's modulus of steel is $2\times 10^{11} N/m^2$.
14. Explain the molecular theory of surface tension.
15. A steel wire of 1mm radius is bent to form a circle of 10cm radius. What is the bending moment and the maximum stress. Young's modulus is 2×10^{11} N/m^2.
16. What amount of energy will be liberated if 1000 droplets of water each $10^{-6} cm$ in diameter coalesce to form one large spherical drop.
    Surface Tension of water = 0.075N/m.
17. A Carnot engine working between two temperatures has an efficiency 12.5%. If the temperature of sink is reduced by 95^0C, its efficiency is doubled. Find the temp of source and sink.
18. An ice block of mass 12 Kg is put into a large lake of water at 20^0C so that the final temp: is 20^0C. Find the change in entropy of ice, lake water and universe?
    (Cv of water = 4200 J/ Kg, Latent heat of ice =$3.36\text{x}10^5$ J /Kg)
19. What is available energy? Explain how available energy is related with entropy.

(Ceiling- 30)

Section C- Essay Type

Answer any one question. Answer carries 10 marks

20. What is a beam? Derive an expression for bending moment of a beam.
21. What is a heat engine? With the help of Carnot cycle explain and derive equation for efficiency of a carnot engine.

(1x10= 10 marks)