12121

Reg. No. | | | | | | | | |

I Semester B.Sc. Degree Examination, March/April - 2022

PHYSICS

Mechanics & Properties of Matter

(CBCS Semester Scheme Repeaters 2020 - 21 & Onwards)

Paper : I

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. All multiple - choice questions in part A are to be compulsory answered in Page 1.
2. Non - programmable scientific calculators are allowed.

PART - A

Answer **all** questions. Each question carries **one** marks. (10×1=10)

1. A body is moving with constant speed in a straight line. A force is not required to

a. increase its speed
b. decrease its momentum.
c. change its direction
d. keep it moving with uniform velocity

2. Maximum value of static friction is called.

a. limiting friction.
b. rolling friction.
c. sliding friction
d. normal reaction

3. If two bodies stick together after collision, then the nature of collision will be

a. perfectly elastic
b. partially inelastic
c. perfectly inelastic
d. partially elastic

4. The square of the time period of a planet is proportional to _____ of the semi major axis of its orbit.

a. cube
b. square
c. square root
d. cube root

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5. Acceleration due to gravity on the surface of the earth is maximum at

a. poles b. equator

c. 30° latitude d. 40° latitude

6. The angular momentum of a body with moment of inertia I and angular velocity ω is

a. $1\ \omega$ b. $\frac{1}{\omega}$

c. $1\omega^2$ d. $\frac{1}{\omega^2}$

7. A couple acting on a body produces

a. linear motion b. rotational motion

c. both linear and rotational motion d. neither linear nor rotational motion

8. The time period of a simple pendulum is 2 s. If the length is increased 4 times, the period becomes.

a. 6 s b. 2 s

c. 8 s d. 4 s

9. A liquid does not wet the surface of a solid if the angle of contant is

a. 45° b. obtuse

c. zero d. 90°

10. The coefficient of viscosity of a liquid does not depend on

a. density of the liquid b. temperature of the liquid

c. pressure of the liquid d. nature of the liquid

PART - B

Answer any **five** question. Each question carries **Two** marks. **(5×2=10)**

11. Distinguish between static and dynamic friction.

12. What are inertial and non - inertial frames of reference?

13. What is a non - conservative force? Give an example.

14. State Newton's law of gravitation and and write its mathematical form.

15. State perpendicular axes theorem.

16. Write the expression for period of oscillation of a compound pendulum and explain the symbols.

17. Define surface tension of a liquid and mention its SI unit.

18. Define rigidity modululs and bulk modulus.

PART - C

Answer any **five** questions. Each question carries **six** marks. **(5×6=30)**

19. a) What is angle of repose?

    b) Derive the relation between the angle of repose and the coefficient of static friction. **(1+5)**

20. Derive an expression for the velocity of a particle moving in a resistive medium under gravity assuming the resistive force to be directly proportional to the velocity. **(6)**

21. a) Explain the principle of rocket motion.

    b) Derive the expression for the velocity of a rocket neglecting the acceleration due to gravity. **(2+4)**

22. State and explain Kepler's laws of planetary motion. **(6)**

23. a) Define radius of gyration.

    b) Derive an expression for the moment of inertia of a circular disc about an axis perpendicular to its plane. **(1+5)**

24. a) What is simple harmonic motion?

    b) Obtain an expression for the velocity and accelearation of a particle executing simple harmonic motion. **(1+5)**

25. Explain with necessary theory the method of determining the interfacial tension between any two immiscible liquids by drop weight method. **(6)**

26. a) Define Young's modulus.

    b) Derive an expression for the work done per unit volume in stretching a wire. **(1+5)**

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PART - D

Answer any **four** questions. Each question carries **five** marks. **(4×5=20)**

27. A body of mass 5 kg moves with a constant acceleration of $(3i+4j)ms^{-2}$. Calculate the force and its magnitude.

28. A block is placed on the top of an inclined plane 5m long, the plane makes an angle of 60^{o} with the horizontal. If the coefficient of friction between the block and the plane is 0.3, find the time taken by the block to slide down the plane.

29. The force acting on a particle moving parallel to the x axis is $F = 6x^2 + 2x$. Calculate the work done in displacing the particle from $x = 1$ to $x = 2$.

30. Calculate the acceleration due to gravity on the surface of Jupiter if the mass of Jupiter is 317 times that of the earth and the radius of Jupiter is 10.95 times that of the earth.

    Given : $g = 9.8\ ms^{-2}$ on earth

31. A fly wheel of mass 5 kg and radius 0.1m makes 600 revolutions per minute. Calculate the moment of inertia and energy of the fly wheel.

32. If the potential energy of a particle performing simple harmonic motion is 3J when the displacement is half of the amplitude, find the total energy of the particle.

33. Calculate the change in surface energy of a soap bubble when its radius decreases from 0.05 m to 0.01 m. Surface tension of soap solution = $2.0\times10^{-2}Nm^{-1}$.

34. What force is required to stretch a steel wire of cross sectional area $1cm^2$ by 1%?

    Given : Young's modulus = $2\times10^{11}Nm^{-2}$.