T   # COMMON QUARTERLY EXAMINATION - 2024

Standard - XI   Reg.No. ☐☐☐☐☐☐

Time: 3.00 hrs.   **PHYSICS**   *Marks: 70*

I. Answer all the questions: 15×1=15

1) If the masses of the Earth and Sun suddenly double, the gravitational force between them will
   a) remain the same   b) increase 2 times
   c) increase 4 times   d) decrease 2 times

2) The time period of a satellite orbiting Earth in a circular orbit is independent of
   a) radius of the orbit   b) the mass of the satellite
   c) both the mass of the satellite and radius of the orbit
   d) neither the mass of the satellite nor the radius of its orbit

3) According to Kepler's second law the radial vector to a planet from the sun sweeps out equal areas in equal intervals of time. This law is a consequence of
   a) conservation of linear momentum   b) conservation of angular momentum
   c) conservation of energy   d) conservation of kinetic energy

4) The ratio of the acceleration for a solid sphere (mass m and radius r) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,
   a) 5:7   b) 2:3   c) 2:5   d) 7:5

5) The speed of the centre of wheel rolling on a horizontal surface is v_0. A point on the rim in level with the centre will be moving at a speed of,
   a) zero   b) v_0 c) $\sqrt{2}v_0$ d) $2v_0$

6) The centre of mass of a system of particles does not depend upon,
   a) position of particles   b) relative distance between particles
   c) masses of particles   d) force acting on particle

7) A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then, the long piece will have a force constant of
   a) $\frac{2}{3}K$ b) $\frac{3}{2}K$ c) 3K   d) 6K

8) A ball of mass 1 kg and another of mass 2 kg are dropped from a tall building whose height is 80m. After, a fall of 40m each towards Earth, their respective kinetic energies will be in the ratio of
   a) $\sqrt{2}:1$ b) $1:\sqrt{2}$ c) 2:1   d) 1:2

9) A body of mass 4m is lying in xy-plane at rest. It suddenly explodes into three pieces. Two pieces each of mass m move perpendicular to each other with equal speed v. The total kinetic energy generated due to explosion is
   a) mv^2 b) $\frac{3}{2}mv^2$ c) $2mv^2$ d) $4mv^2$

10) Force acting on the particle moving with constant speed is
    a) always zero   b) need not be zero
    c) always non zero   d) cannot be concluded

11) If a person moving from pole to equator, the centrifugal force acting on him
    a) increases   b) decreases
    c) remains the same   d) increases and then decreases

12) A book is at rest on the table which exerts a normal force on the book. If this force is considered as reaction force, what is the action force according to Newton's third law?
    a) Gravitational force exered by earth on the book
    b) Gravitational force exerted by the book on earth
    c) Normal force exerted by the book on the table
    d) None of the above

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13) Which one of the following physical quantities cannot be represented by a scalar?
   a) mass
   b) length
   c) momentum
   d) magnitude of acceleration

14) If a particle executes uniform circular motion in the xy plane in clockwise direction, then the angular velocity is
   a) +y direction   b) +z direction   c) –z direction   d) –x direction

15) If the force is proportional to square of velocity, then the dimension of proportionality constant is
   a) $[MLT^0]$ b) $[MLT^{-1}]$ c) $[ML^{-2}T]$ d) $[ML^{-1}T^0]$

II. Answer any 6 questions. Question No. 23 is compulsory: 6×2=12

16) State Kepler's law of period.
17) What is the difference between sliding and slipping?
18) Define couple.
19) Define coefficient of restitution.
20) Define power.
21) Define one Newton.
22) State Lami's Theorem.
23) A particle moves in a circle of radius 10m. Its linear speed is given by v=3t where t is in second and v is in ms-1.
    Find the centripetal and tangential acceleration at t=2s.
24) Define the gravitional field. Give its unit.

III. Answer any 6 questions. Question No. 27 is compulsory: 6×3=18

25) State Newton's Universal law of gravitation.
26) How will you measure the diameter of the Moon using parallax method?
27) Find the dimensions of mass in terms of Energy, length and time?
28) Define velocity and speed.
29) Explain various types of friction. Suggest a few methods to reduce friction.
30) Under what condition will a car skid on a leveled circular road?
31) Explain the characteristics of elastic and inelastic collision.
32) Define centre of gravity.
33) State conservation of angular momentum.

IV. Answer all the questions: 5×5=25

34) a) State and explain work energy principle. Mention any three examples for it.   **(OR)**
    b) Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle θ with respect to the horizontal direction.

35) a) Obtain an expression for the time period T of a simple pendulum. The time period T depends on (i) mass 'm' of the bob (ii) length 'l' of the pendulum and (iii) acceleration due to gravity at the place where the pendulum is suspended. (constant k = 2π)   **(OR)**
    b) Explain the variation of g with depth from the Earth's surface.

36) a) Arrive at an expresison for elastic collision in one dimension.   **(OR)**
    b) Explain the need for banking of tracks.

37) a) State and prove parallel axis theorem.   **(OR)**
    b) Prove that at points near the surface of the earth, the gravitational potential energy of the object is U = mgh.

38) a) Explain the similarities and differences of centripetal and centrifugal forces.   **(OR)**
    b) Explain the types of equilibrium with suitable examples.

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