

Code 042 (E) B

Time: 3 Hrs

M.M.: 70

- Q 1 to 5 One mark each
 Q 6 to 10 Two marks each
 Q 11 to 22 Three marks each
 Q 23 Four marks
 Q 24 to 26 Five marks each

X7 PHYSICS.

- The displacement – time graph of the two particles A and B are straight lines inclined at angles of 30° and 45° with the time axis. What is the ratio of the velocities v_A and v_B ?
- Can two non- zero vectors give zero resultant when they multiply with each other? If yes, give condition for the same.
- Define angle of repose.
- Two protons are brought closer. How will the PE of the system change and why?
- If earth be at one half of its present distance from the sun, how many days will be there in a year?
- Graphically show that friction is self adjusting force.
- State work energy theorem. Prove it for variable force.
- Find the value of 60 W on a system having 100 g, 20 cm and 1 min as the fundamental units. $60 \times 10^6 W$
- Two particles begin to fall freely from rest from the top of a tower within a gap of 1 second. How long after the first particle begins to fall. the two particles be 15 m apart?
- Find expression for co ordinates of the centre of mass of a two particle system.

OR

State and prove parallelogram law of vectors.

- A steel ball of radius r is allowed to fall under gravity through a viscous liquid of coefficient of viscosity η . After some time it attains a constant velocity v . This velocity depends upon the weight of the ball mg , η and r . Find the expression for v dimensionally. $mg/\eta r$
- Why is it easier to pull a lawn mower than to push it. Draw vector diagram to explain it.
- Show that the velocity with which an object is to be projected from the surface of the earth of the earth so that it may just overcome the gravitational pull of the earth is $(2GM/R)^{1/2}$.
- Two masses m_1 and m_2 ($m_1 > m_2$) are connected by an inextensible and light string. The string passes over a frictionless pulley. Calculate the acceleration of the masses and tension in the string.
- Find the acceleration due to gravity at a depth d from the surface of the earth.
- State and prove Kepler's second law of planetary motion. Name the physical quantities which remain constant during the planetary motion.
- A person of mass m is standing in a lift. Find his apparent weight when the lift is :
 - Moving upward with uniform acceleration a ,
 - Moving downward with uniform acceleration a ($<g$)
 - Falls freely
- On a two lane road, car A is travelling with a speed of 36 kmph. Two cars B and C approach car A in opposite directions with a speed of 54 kmph each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident?
- A cyclist is riding with a speed of 27 kmph. As he approaches a circular turn of radius 80 m, he applies brakes and reduces his speed at the constant rate of 0.5 m/s every second. What is the magnitude and direction of the net acceleration of the cyclist on the circular turn?

20. The inclination θ of a rough inclined plane is increased gradually. The body on the plane just comes into motion when inclination becomes 30° . Find coefficient of friction. The inclination is further increased to 45° . Find the acceleration of the body along the plane.
21. (a) What is the work done by the tension in the string of a simple pendulum?
 (b) Differentiate between conservative and non conservative forces.
22. A particle is moving along a straight line and its position is given by the relation:
 $x = [t^3 - 6t^2 - 15t + 40]m$. Find
 (a) The time at which its velocity is zero.
 (b) The position and displacement of the particle at that point,
 (c) The acceleration of the particle at that time.
23. Mohan, a diving student, observed that after jumping from the diving springboard, he could neither exhibit somersaults in mid air nor touch the water surface gently. He approached coach, Ram. Ram carefully listened to him and then advised him to curl his body by folding his arms and legs towards the centre of his body in mid air so that he may easily take a somersault. Then while entering the water in the swimming pool, he should straighten his body. Mohan followed Ram's advice and with practice he succeeded. He thanked the diving coach for his advice.
 (a) What according to you are the values displayed by Ram and Mohan?
 (b) Which principle is involved here? State the principle and explain it briefly.
 (c) Give another illustration / application of the principle.

OR

One day, Mohinder Singh and his grandmother who resided on first floor of the building, observed smoke coming from neighboring flat. Soon flames erupted from the flat and were blocking the staircase. Mohinder could escape easily but he thought about how to save his aged and weak grandmother. He used his turban cloth and suspended it downward from the balcony and asked the person on the ground to hold the other end of the cloth. Now he asked his grandmother to sit gently on the turban cloth and slide along it. She reached to safety and the cloth remained intact.

- (a) What values were exhibited by Mohinder?
 (b) What is the principle employed by Mohinder?
 (c) What will be the tension in the cloth inclined at an angle 30° from horizontal when a person of mass 40 kg slides along it with an acceleration of $2m/s^2$?
24. What is a projectile? What are the two types of projectiles? Determine the trajectory of a horizontal projectile and its velocity at any time t .
25. Differentiate between elastic and inelastic collisions. Find the final velocities of two bodies undergoing one dimensional elastic collision. Specify what will happen if both have the same mass.
26. (a) State parallel and perpendicular axes theorems.
 (b) Find moment of inertia of a disc about (i) a tangent perpendicular to its plane, (ii) its diameter.
 Or
 (a) Write two characteristics of a standard unit.
 (b) Define instantaneous velocity.
 (c) In the vector product $C = A \times B$, which vectors are always perpendicular?
 (d) For uniform circular motion, does the direction of the centripetal force depend on the sense of rotation – clockwise or anticlockwise?
 (e) What are central forces?