Roll No. [   ]   **Total No. of Pages : 02**

Total No. of Questions : 07

B.Sc. (CS) (2013 & Onwards)   (Sem.–5)
FUNDAMENTALS OF DYNAMICS
Subject Code : BCS-502
Paper ID : [72575]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

Q1. Answer briefly :

a) Why the curved tracks are generally banked?

b) Distinguish between mass and weight.

c) What acceleration is produced in a mass of 100 kg by a force of 720 N?

d) What is conservative force? Show that central force is conservative.

e) Derive an expression for maximum height of projectile at any instant.

f) What does conservation of energy mean?

g) What is the gravitational constant?

h) What is centre of mass frame of reference?

i) What do you mean by simple harmonic motion?

j) Describe Kepler's second law.

SECTION-B

Q2. a) A train of mass 2×10^5 kg is travelling at 45 km/h. The engine is put off and the brakes are applied. What is the force of retardation if the train stops in 100 s?

b) An object dropped from a balloon reaches the ground in 20 s. determine the height of the balloon when the object was dropped if

(i) It was at rest in the air and

(ii) It was ascending with a speed of 50 m/s when the object was dropped.

Q3. a) What is the principle of conservation of linear momentum? Show that the linear momentum of a system of particles remains constant in the absence of any external force acting on it.

b) When one sharpens a knife on a grinding wheel, the spark particles fly at a tangent to the wheel, why?

Q4. a) A 1000 kg car is coating down an incline of 30°. At a time when the car's speed is 12 m/s, the driver applies the brakes. What constant force parallel to the incline must result if the car is to stop after travelling 100 m?

b) A mass moves in a circle of radius 50 cm at 2 revolutions per second. Calculate the linear speed and the acceleration of the body.

Q5. Write an expression for the angular momentum of a system of particles and use it to obtain an expression for the torque acting on the system.

Q6. Prove that the kinetic energies of two colliding particles in the centre of mass system are inversely proportional to their masses.

Q7. How does Kepler's third law of planetary motion provide evidence that the force between a planet and sun obeys inverse square law?