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

M.Code : 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) Write the relation between the force and the torque.

(b) Can an object be accelerated without speeding up or slowing down?

(c) The greatest height to which a man can throw a stone is 'h'. What will be the greatest distance up to which he can throw the stone?

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

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

(f) Explain why an ice skater always utilizes the principle of conservation of angular momentum?

(g) A cyclist is riding a bicycle without holding the handle. He wishes to turn to one side. Explain how.

(h) State Newton's law of gravitation.

(i) What do you mean by simple harmonic motion?

(j) Describe Kepler's second law.

SECTION-B

2. (a) A train was moving at a rate of 36km/h. When the brakes were applied, it comes to rest in a distance of 200m. Calculate the retardation produced in the train.

   (b) Show that there are two angles of projection for which the horizontal range is same.

3. (a) A bullet of mass 0.01kg is fired horizontally onto a 4kg wooden block at rest on a horizontal surface. The coefficient of kinetic friction between the block and the surface is 0.25. The bullet remains embedded in the block and the combination moves 20m before coming to rest. With what speed did the bullet strike the block?

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

4. (a) Discuss briefly the motion of a simple pendulum swinging in a vertical plane.

   (b) A curved road of diameter 1.8 km is banked so that no friction is required at a speed of 30 ms^{-1}. What is the banking angle?

5. State and explain the law of conservation of angular momentum. Illustrate with examples. What are consequences of the law of conservation of angular momentum?

6. Derive an expression for the gravitational potential at a point :

   (a) Outside

   (b) On the surface and

   (c) Inside a solid sphere.

7. State and prove Kepler's laws of planetary motion using the concept of reduced mass.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.