



# RAN-1190

## B. Sc. (Mathematics) Sem - VI Examination

March / April - 2019

Mathematics (E. G.)

Mechanics - II

Time: 2 Hours ]

[ Total Marks: 50

### સૂચના : / Instructions

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.  
Fill up strictly the details of signs on your answer book

Name of the Examination:

B. Sc. (Mathematics) Sem - VI

Name of the Subject :

Mathematics (E. G.) Mechanics - II

Subject Code No.: 1 1 9 0

Seat No.:

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Student's Signature

- (1) Attempt all questions.
- (2) Each question carry equal marks.
- (3) Follow usual notations and conventions.
- (4) Figures to the right indicate full marks of the corresponding question.
- (5) Use of non-programmable scientific calculator is permitted.

### Que 1 Answer any FIVE of the following:

(05)

- (1) State the dimension of angular momentum and linear momentum.
- (2) Define: Kinetic energy of a system.
- (3) Explain : Angular momentum of a system about a line.
- (4) Show that the velocity of a particle moving in a plane has a direction tangent to the path and a magnitude  $ds/dt$ .
- (5) Explain: Kinematics.
- (6) State the law of motion of the mass center of a system.
- (7) What is simple pendulum?
- (8) Explain: periodic time and periodic motion of a particle.

**Que 2      Attempt any TWO of the following:      (15)**

- (a) If a particle travels on a circle of radius  $r$  with a constant speed  $v$  then show that the acceleration vector is directed inward along the radius with magnitude  $v^2/r$ .
- (b) If a particle has an acceleration which is constant in magnitude and direction, then prove that the hodograph is a straight line described with constant speed.
- (c) Obtain the radial and transverse components of velocity and acceleration.

**Que 3      Attempt any TWO of the following:      (15)**

- (a) State and prove the principle of linear momentum for a system of particles.
- (b) Show that the rate of change of a kinetic energy of a system is equal to the rate of working of all the forces, external and internal.
- (c) State and prove the principle of angular momentum relative to the mass center.

**Que 4      Attempt any TWO of the following:      (15)**

- (a) Explain harmonic Oscillator. Also determine the period, amplitude, maximum velocity and maximum acceleration of the Harmonic oscillator.
- (b) Find the greatest distance that a stone can be thrown inside a horizontal tunnel 10 ft high with a velocity of projection of  $80 \text{ ft sec}^{-1}$ . Find also the corresponding time of flight.
- (c) Show that path of a projectile is a parabola. Also show that the speed at any point P on the parabolic trajectory is equal to the speed acquired in free fall to P from rest at the directrix L.

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