* A D - 3 2 5 6 *

AD-3256

B. Sc. (Sem. VI) Examination

March/April – 2015

Mathematics (E.G.) : Mechanics - II

Time : **2** Hours] [Total Marks : **50**

Instructions :

(1)

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

Name of the Examination :

☛ **B. SC. (SEM. VI)**

Name of the Subject :

☛ **MATHEMATICS (E.G.) : MECHANICS - II**

☛ Subject Code No. : **3 2 5 6** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) First question is compulsory.

(3) Figures to the right indicate marks of question.

(4) Follow usual notations.

1 Answer any **FIVE** of the following questions: **5**

(1) Explain, in short, what you mean by Kinematics.

(2) At a certain instant, a particle of mass m, moving freely in a vertical plane under gravity is at a height h above the ground and has a speed v. Use the principle of energy to find its speed when it strikes the ground.

(3) State any two useful forms of the equation of a motion of a particle.

(4) If $x = 3\cos 2t - 4\sin 2t$ then determine the period of the motion.

(5) State the dimension of angular momentum and linear momentum.

(6) Explain in short what you mean by harmonic oscillator,

(7) If $x = 5\cos 3t + 5\sin 3t$ then find the amplitude of the motion.

(8) What is the frequency of a simple pendulum 2.0 meters long?

2 (a) Obtain the tangential and normal components of velocity and acceleration. 8

OR

2 (a) Obtain the radial and transverse components of velocity and acceleration. 8

(b) If a particle moves in a plane with a constant speed, then prove that its acceleration is perpendicular to its velocity. 7

OR

(b) Is it possible for a particle to move in a circle and have a hodograph which is a straight line? Give reasons for your answer. 7

3 (a) State and prove the law of motion of the mass center of a system. 8

OR

(a) State and prove the principle of angular momentum relative to the mass center. 8

(b) State and prove the principle of conservation of energy for a system. 7

OR

(b) Prove that the rate of change of kinetic energy of a system is equal to the rate of working of all the internal and external forces. 7

4 (a) Show that the motion of a simple pendulum is periodic. Also find the periodic time. 8

OR

(a) Discuss the effect of disturbing force of the harmonic oscillator. 8

(b) A particle is projected upwards in a direction inclined at 60° to the horizontal. Show that its velocity when at its greatest height is half of its initial velocity. 7

OR

(b) Prove that the directrix of parabolic trajectory is at the greatest height. 7