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DRR-3256

B. Sc. (Sem. VI) Examination

March / April - 2016

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 corresponding question.

(4) Follow usual notations.

(5) Use of non-programmable scientific calculator is allowed.

1 Answer any five of the following: **5**

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

(2) State the principle of energy of a particle.

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

(4) What is the frequency of a simple pendulum 4.0 meters long?

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

(6) Explain: Hodograph.

(7) Explain in short what you mean by harmonic oscillator.

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

OR

(a) Prove that the velocity in the Hodograph is equal to the acceleration in the actual motion. 8

(b) Answer any **one** of the following : 7

(1) 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.

(2) The position of a moving particle is at any instant given by $r = A\cos\theta\hat{i} + A\sin\theta\hat{j}$. Show that the force acting on it is conservative. Also calculate the total energy of the particle.

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

OR

(a) State and prove the principle of angular momentum for a particle moving in a plane. 8

(b) Answer any ONE of the following : 7

(1) Show that the rate of change of angular momentum relative to the mass centre is equal to the moment of the external forces about the mass centre.

(2) State and prove the principle of conservation of energy for a particle.

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

OR

(a) Prove that the motion of simple pendulum is simple harmonic. Also determine the period, amplitude, maximum velocity and maximum acceleration of the motion. 8

(b) Answer any ONE of the following : 7

(1) A simple pendulum of length 100 cm has an energy equal to 2×10^6 ergs when its amplitude is 4 cm. Calculate its energy when its length is doubled.

(2) Derive the equation of the parabolic trajectory in the form $y = -\frac{gx^2}{2u_0^2}$.