**Roll No……..** **Total No. of Printed Pages: [02]**
**Total No. of Questions: [09]**

**B.Sc. Non-Medical (Semester –1st)**
**MECHANICS (Core Course-1)**
**SUBJECT CODE: BSNMS1102**
**Paper ID: [19131402]**

**Time: 03 Hours** **Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is Compulsory.
2. Attempt any FOUR questions from Section B.
3. Attempt any TWO questions from Section C.

**Section – A** **(2 marks each)**

Q1. Attempt all questions:-

a. Define stress and strain. Draw stress-strain diagram.

b. How angular velocity is related to angular momentum? Write SI units of both.

c. How to find the position of centre of mass for a system of *n*-particles?

d. What do you mean by geosynchronous orbits?

e. State Kepler's laws of planetary motion.

f. In case of SHM, at what displacement from the mean position, the kinetic energy is equal to potential energy?

g. What is Poisson's ratio? Write Poisson's ratio in terms of elastic constants.

h. With what velocity a rocket should move so that every year spent on it corresponds to 4 years on Earth?

i. What is GPS? How does it work?

j. Define torque. If angular momentum of a body remains constant during rotational motion, what is the net torque acting on it?

**Section – B** **(5 marks each)**

Q2. Give mathematical evaluation of two body problem and its reduction to one body problem and its solution.

Q3. What do you mean by damped oscillator? Discuss the case in which the system has an oscillatory motion.

Q4. What are fictitious forces? Discuss these in detail.

Q5. What is the relation between mass and energy? Derive mass-energy equivalence relation.

Q6. Write the expression for total energy of simple harmonic oscillator. The displacement of a particle executing SHM is given by $x = A \cos \omega t$. Find the displacement at which kinetic energy of particle is equal to its potential energy.

**Section – C** **(10 marks each)**

Q7. Describe Michelson-Morley experiment. What is the significance of this experiment? How it leads to the rejection of Ether hypothesis?

Q8. What are the postulates of special theory of relativity? Obtain Lorentz transformation equations for two inertial frames of reference.

Q9. Prove that the angular momentum of the particle moving under central force remains constant. Show that this forms the basis of Kepler's laws.