Roll No……..….. **Total No. of Printed Pages: 1**

Total No. of Questions: [09]

B. Tech. (Civil, Aeronautical & Aerospace Avionic) (Semester – 1st/2nd)
PHYSICS (MECHANICS AND MECHANICS OF SOLIDS)
Subject Code: BPHYS4101
Paper ID: [19110013]

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

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) What is the Quality factor of a forced oscillator?
b) Are Newton's laws invariant under Galilean transformations? Explain.
c) What is a non-inertial frame of reference?
d) Why length contraction is not observed in daily life?
e) Can a particle of zero rest mass be at rest? Explain.
f) What are Conservative and Non-Conservative forces? Explain with examples.
g) Are all periodic motions SHM? Is the reverse true? Explain.
h) What is elastic potential energy?
i) Define laws of conservation of energy.
j) The planet's velocity increases when they come near the Sun. Explain?

Section – B **(5 marks each)**

Q2. Prove that acceleration is invariant under Galilean transformation equations.

Q3. Derive the Lorentz transformation equations.

Q4. State and Prove the work energy theorem.

Q5. Explain the role of restoring force and inertia in SHM. At what displacement will the kinetic energy and potential energy be equal in a simple harmonic oscillator?

Q6. What is the centre of mass? Reduce a two-body problem to an equivalent one-body problem using reduced mass. Give the physical meaning of reduced mass.

Section – C **(10 marks each)**

Q7. Describe the Michelson-Morley experiment and explain the physical significance of the results. What is Galilean invariance?

Q8. State and Prove Kepler's law of Planetary motion using the concept of reduced mass.

Q9. Derive an expression for power supplied by driving force and the average dissipated by the damping force for a forced damping oscillator.