Sl. No. of Ques. Paper : **1874**   **GC-3**

Unique Paper Code   : **42171108**

Name of Paper   : **Mathophysics Mechanics**

Name of Course   : **B.Sc. (Prog.) (Choice Based Credit System Exams)**

Semester   : **I**

Duration :   : **3 hours**

Maximum Marks   : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.
Question No. 1 is compulsory.
All questions carry equal marks.

1. Attempt any five from the following -
    (a) What are inertial and non-inertial frame of references? Explain with examples. 3
    (b) Define modulus of rigidity, Young's modulus and bulk modulus   3
    (c) Write down two postulates of special theory of relativity.   3
    (d) A space ship having length of 10 m is moving at a speed of 0.9 c (where 'c' is speed of light); calculate its length contraction in a rest frame of reference. 3
    (e) Explain conservative and non-conservative forces with examples. 3
    (d) State Kepler's laws and Newton's gravitation law. 3
    (f) Differentiate between simple and damped harmonic oscillations. 3

2. (a) Write down the Lorentz transformation equations. Using these equations derive the formula for (a) Length contraction and (b) Time dilation   5,5,5

3. Explain the principle of motion of a rocket. Deduce the expression for the velocity of a rocket.   5,10

4. Compute the expression for orbital velocity and period of revolution of a satellite. Differentiate between geostationary and sun-synchronous satellites.   5,5,5

5. State Hooke's Law. Derive a relation between Poisson's ratio (σ) Bulk modulus (K) and modulus of rigidity (η).   3,12

6. Give a differential equation of a damped harmonic oscillator and solve it for
    a) A case of over damping, b) Case of critical damping, and c) Case of under damping
                                                              3,4,4,4

P.T.O.

7. Solve the following equation –

(a) $(d^2y/dx^2) - 5(dy/dx) + 6y = \sin 4x$ 7

(b) $x^2(d^2y/dx^2) - 8x(dy/dx) + 12y = x$ 8

300