14112778

DOON UNIVERSITY, DEHRADUN

End Semester Examination, Second Semester, 2016-17

School of Physical Sciences

Core Physics 5 Years (Integrated) MSc Programmes

Course: PHC-102: Mechanics

Time Allowed: 3 Hours *Maximum Marks: 30*

Note: Attempt All Questions from Sections A and B. There is choice in section C.

SECTION: A *(Marks: 2 X 4 =8)*

1. Give two examples to illustrate the law of conservation of linear momentum with explanation.
2. With what velocity should a rocket move so that every year spent on it corresponds to four years on earth?
3. What is damping? On what factors the damping depends?
4. State the postulates of special theory of relativity.

SECTION: B *(Marks: 4 X 3=12)*

5. (a) What do you mean by angular momentum. Explain the geometrical meaning of angular momentum.
   (b) Calculate the work done per unit volume of a body for volumetric strain.

6. Differentiate between simple harmonic oscillator, damped oscillator and driven oscillator. Prove that total energy of a simple harmonic oscillator is constant.

7. Discuss fully the Michelson -Morley experiment with important results obtained from it.

SECTION: C (Attempt any part from e or f) *(Marks: 10)*

8. Solve the following parts:

(a) A solid cylinder of radius 5 cm is converted into a hollow cylinder of same mass and length and external radius 7 cm. If the restoring couple per unit radian twist in original cylinder, is C, deduce the same for the new hollow cylinder.

(b) A particle is subjected to a central force $F = Ae^{-\alpha r}$ where A and α are constants. Calculate the potential energy associated with force.

(c) A particle of mass 100 gm is placed in a field of potential $U = 5x^2 + 10$ ergs/gm. Find the frequency.

(d) A solid cylinder of mass 20 kg rotates about its axis with angular speed 100 rad s^{-1}. The radius of cylinder is 0.25 m. What is kinetic energy associated with its rotation?

(e) State Kepler's law of planetary motion.

OR

(f) Obtain the formula for relativistic length contraction.