

This question paper contains 3 printed pages]

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S. No. of Question Paper : 7877

Unique Paper Code : 2221102

F-1

Name of the Paper : Mechanics (PHHT 102) (DC-1.2)

Name of the Course : B.Sc. (Hons.) Physics

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 number 1 is compulsory.

1. Attempt any *five* of the following :

5×3=15

- (a) What are the *two* postulates of special theory of relativity ?
- (b) Differentiate inertial and non-inertial reference frames with examples.
- (c) Define gravitational potential energy. How does it vary with distance represent graphically ?
- (d) Differentiate among free, damped and forced harmonic oscillations.
- (e) What are conservative and non-conservative forces ? Explain with examples.

P.T.O.

- (f) Define radius of gyration. How does a compound pendulum prove a better choice for the computation of 'g' in comparison to normal string and bob set-up (i.e. simple pendulum) ?
- (g) What was the main objective of the Michelson Morley experiment ?
2. (a) Derive Einstein mass-energy equivalence formula.
- (b) How much mass a proton would gain when accelerated to a kinetic energy of 500 MeV ? 10,5
3. Write down the Lorentz transformation equations, using them derive formula for :
- (a) Time dilation;
- (b) Length contraction. 5,5,5
4. Compute gravitational potential due to a spherical shell at (a) an external point, (b) on the surface, and (c) at an internal point. Show graphical representation of the variation of potential with distance. 5,4,4,2
5. Write down the equation for the damped harmonic oscillations and solve it for over-damped, critically damped and damped oscillations. Also compute time period and logarithmic decrement for the damped oscillations. 5,5,3,2

6. Define moment of Inertia. Show that the moment of inertia of a solid cylinder about its own axis is $MR^2/2$, and about an axis passing through its centre of mass but perpendicular to its length is $M(R^2/4 + L^2/12)$, where M is the mass and L is the length of cylinder. 2,7,6
7. Explain laboratory and centre of mass frames of references. What is the advantage of studying a collision process in centre of mass system ? Prove that in centre of mass system the magnitude of velocities of the particles remain unaltered in elastic collision. 6,5,4