

Roll No.

Exam Code : M-24

Subject Code—61383

B. Sc. EXAMINATION

(Main/Reappear) (Batch 2019 Onwards)

(Second Semester)

PHYSICS

CPL-202 (Core Course—III)

Mechanics-II

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) Define degree of freedom with example.
- (b) What is advantage of generalised coordinate ? *parameter. Defining.*
- (c) What is difference between vibration and oscillation ?

- (d) Calculate the time period if the frequency of SHM is 100 hertz.
- (e) Difference between inertial and non inertial frame of reference.
- (f) What is time dilation ?
- (g) What is massless particle ?
- (h) Show that rest mass of photon is zero.

$$8 \times 2 = 16$$

Unit I

2. (a) Explain the type of constraints with example. 8
- X (b) Derive the relation for generalised force and potential. 8
3. (a) What is Hamilton's variational principle ? Derive the mathematical relation. 12
- (b) Find the Lagrange equation of motion of 1-D Harmonic Oscillator. 4

Unit II

4. (a) Show that average Kinetic Energy of a particle executing SHM is half of total energy. 8
- (b) Write short notes on the following : 8
- (i) Free vibration
 - (ii) Damped vibration
 - (iii) Forced vibration
 - (iv) Resonance.
5. What is damped oscillation ? Discuss and derive its three case highly damped, critically damped and lightly damped. 16

Unit III

6. Explain Michelson-Morley experiment with mathematical derivation and its negative results. 16
7. (a) Show that under Galilean transformation length of rod remain invariant but in Lorentz transformation it get changed. 10

- (b) Two particles come toward each other, each moving with speed $0.9c$ with respect to laboratory as frame of reference. What is their relative speed ? 6

Unit IV

8. (a) Derive the relation between relativistic mass and rest mass of a particle. 10
(b) Show that in Lorentz transformation :

$$p'^2 - \frac{E'^2}{c^2} = p^2 - \frac{E^2}{c^2} . \quad 6$$

9. (a) What is relativistic Doppler Effect ? Derive the expression for longitudinal Doppler Effect. 12
(b) Write short note on red shift and blue shift. 4