(i) **Printed Pages : 3** **Roll No. .....**

(ii) **Questions : 7** **Sub. Code : 0148**

Exam. Code : 0002

B.A./B.Sc. (General) 2nd Semester

1059

PHYSICS

Paper–A Mechanics–II

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :– (1) Attempt **five** questions in all, selecting **two** each from Unit-I and Unit–II. Unit–III is compulsory.

(2) Use of Non programmable scientific calculator is allowed.

UNIT–I

1. (a) Derive the Euler's equations of rotation of rigid body about a fixed point. 3

(b) A moving particle has co-ordinates (6t+3), 8t, 5 m in frame S at any time t The frame S' is moving relative to S with a velocity $3\hat{i}+4\hat{j}$ m/s. Find the co-ordinates and velocity of the particle in frame S' 1.5

2. (a) What do you mean by Galilean invariance ? Show that Law of conservation of momentum and energy remains invariant under Galilean transformations. 3

(b) Explain the physical significance of Michelson Morley Experiment. 1.5

3. Discuss and derive expression for 'Fictitious Forces' in a rotating frame of reference. 4.5

UNIT–II

4. State the postulates of special theory of relativity. Derive Lorentz space time transformation equations for two inertial frames. 4.5

5. (a) What do you understand by time dilation ? What is proper time interval ? Derive expression for it. 3

(b) How much younger an astronaut will appear to an earth observer, if he return after 10 years having moved with a velocity 0.8c ? 1.5

6. (a) What is relativistic momentum and relativistic energy ? Derive relationship between them i.e. $E^2 = p^2c^2 + m_o^2c^2$. 3

(b) Show that the quantity $\left(p^2 - \frac{E^2}{C^2}\right)$ is invariant under Lorentz transformations. 1.5

UNIT–III

7. Attempt any **eight** parts.

(a) What do you mean by rigid body ?

(b) Calculate the time, it will take to turn the plane of oscillation of Foucault's Pendulum through 30° at a point where latitude is 60°.

(c) Two photons are moving towards each other. What is their relative velocity ?

(d) What do you mean by Minkowski space ?

(e) What is twin paradox ?

(f) Define principal axes of inertia.

(g) How does mass of a body change when its speed increases ?

(h) What is relativistic Doppler Effect ?

(i) What is inertia Tensor ?

(j) What is a gyroscope ? $0.5 \times 8 = 4$