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

(ii) Questions : 7 Sub. Code : 0 1 4 8

Exam. Code : 0 0 0 2

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

1048

PHYSICS

Paper : A-Mechanics–II

Time Allowed : Three Hours] **[Maximum Marks : 44**

Note :— Attempt **five** questions in all, selecting at least **two** each from Unit–I and Unit–II. Unit–III is compulsory. Use of log tables and non-programmable calculator is allowed.

UNIT–I

1. (a) What do you understand by fictitious force ? Show that the expression for $\overrightarrow{F_R}$ in rotating frame is given by :

$$\overrightarrow{F_R} = \overrightarrow{F_S} - m\vec{w} \times (\vec{w} \times \vec{r}) - 2m(\vec{w} \times \vec{u}_R)$$

where the letters have their usual meanings. 6

(b) Find the horizontal component of the Coriolis force acting on a body of mass 0.5 mg moving northward with a horizontal velocity of 100 m/s at 30°N latitude of earth. 3

2. (a) Describe Michelson-Morley experiment and explain physical significance of the results. 7

(b) Calculate the time it will take the plane of oscillation of Foucault's pendulum to turn through 90° at a place where the latitude is 30°. 2

3. (a) Obtain Euler's equations for the motion of a rigid body about a fixed point. 6

(b) What do you understand by precession and mutation in case of gyroscope ? 3

UNIT—II

4. (a) Starting from Lorentz's transformations for space co-ordinates derive the equations for transformations of velocity. Under what conditions do these equations reduce to Galilean Transformations for velocity ? 6

(b) The half life of a particle at rest is 2.18×10^{-8} sec. What will be its half life in a beam moving with a speed of 0.8 c ? 3

5. (a) Obtain the relativistic energy relation :

$$E = \sqrt{p^2c^2 + m_0^2c^4} \, .$$ 3

(b) Explain relativistic Doppler effect. 3

(c) What do you mean by Minkowski space ? Why the time co-ordinate is multiplied by c ? 2+1

6. (a) Derive an expression for the relativistic increase in the mass of a body. 7

(b) Calculate the decrease in mass of 1 gm of water at 0°C, when it turns into ice at 0°C. 2

UNIT–III

7. Attempt any **eight** parts, each part carries **1** mark :

(a) What is twin paradox ?

(b) Is earth an inertial frame of reference ?

(c) How the Coriolis force affects the weather ?

(d) At what latitude will the plane of vibration of Foucault's pendulum not rotate at all ?

(e) Give two postulates of special theory of relativity.

(f) Why length contraction is not observed in daily life ?

(g) "Inertia tensor is symmetric". Explain.

(h) What are Galilean transformations ?

(i) How the rotation of earth affects the value of 'g' ?

(j) What do you mean by asymmetric top ? $8 \times 1 = 8$