

T.Y.B.SC. SEM – V (2014 Course) : WINTER - 2018

SUBJECT: PHYSICS: CLASSICAL MECHANICS

Day : Wednesday
Date : 17/10/2018

W-2018-0845

Time : 12.00 NOON TO 02.00 PM
Max. Marks: 40.

N.B.:

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the **RIGHT** indicate full marks.
 - 3) Draw neat labeled diagrams **WHEREVER** necessary.
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Q.1 Attempt any **TWO** of the following. **(10)**

- (a) What are constraints? Explain its types.
- (b) Explain the equation of motion for simple pendulum
- (c) Explain the D'Alembert's principle

Q.2 Attempt any **TWO** of the following. **(10)**

- (a) Obtain an equation for Coriolis's force in nature.
- (b) A beam of electron with a speed of 3×10^7 m/s enters in a uniform magnetic field at right angles to the direction of the field. The beam describes a circular path of radius 0.1 m. Determine the magnetic field.
- (c) Obtain the relation between angular momentum L about origin 'O' and total angular momentum (L') about C.M.

Q.3 Attempt any **TWO** of the following. **(10)**

- (a) Derive the equation of motion for compound pendulum.
- (b) Obtain an expression for motion of charged particle under constant electric and magnetic fields.
- (c) Derive the expression for one dimensional simple harmonic oscillator in phase space.

Q.4 Attempt any **FIVE** of the following. **(10)**

- (a) Explain Newton's first law of motion.
- (b) Express the potential energy function 'V' in the form of $\mathbf{F} = -\nabla V$. Where force 'F' is conservative.
- (c) The particle of mass (m) carrying positive charge 'q' is accelerated by a potential 'V'. It passes with a constant velocity through the distance 'x' between two grids. Find the transit time between the grids in terms of x, m, q and V.
- (d) What is the centre of mass? Explain.
- (e) Electrons are injected with a velocity of 2×10^7 m/s into a uniform magnetic field in a transverse direction. If the magnetic induction is 2×10^{-3} Wb/m², find the radius of circular path.
Electronic mass = 9×10^{-31} kg and electronic charge = 1.6×10^{-19} C
- (f) What is the central force? Explain.
- (g) Write a short note on generalized coordinates.

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