

BACHELOR OF SCIENCE (CBCS-2018 COURSE)
T. Y. B. Sc. Sem-V : WINTER- 2022
SUBJECT : PHYSICS : CLASSICAL MECHANICS

Day : Friday

Date : 16-12-2022

W-18410-2022

Time : 02:00 PM-05:00 PM

Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.

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- Q 1.** Attempt any **Two** of the following. (12)
- (a) Derive the Lagrangian equation by using the D'Alembert's principle.
 - (b) Comet on equation $g_{\text{eff}} = g - \omega \times (\omega \times r)$. Draw a necessary diagram.
 - (c) Derive an expression for a motion of charged particle under constant electric field
- Q 2.** Attempt any **Two** of the following. (12)
- (a) Derive an expression for reduction of the two body problem into one body problem
 - (b) What are the constraints? Explain the types of constraints.
 - (c) With neat diagram, derive the Lagrangian equation for Atwood's machine.
- Q 3.** Attempt any **Two** of the following. (12)
- (a) What is the Corioli's force? Explain the effect of Corioli's force on the earth.
 - (b) A particle describes a conic $1/r = 1 + e \cos \theta$, where 'l' is Semi latus rectum and 'e' is the eccentricity. Show that the force under which the particle is moving is central force.
 - (c) Derive an expression for the motion of charged particle under constant magnetic field.
- Q 4.** Attempt any **Three** of the following. (12)
- (a) Derive an expression for D'Alembert's principle.
 - (b) A system of particles consists of mass of 3 gm located at point A(2,3,0), mass of 5 gm at point B(-2,-3,2) and mass of 2 gm at point C(3,1,1). Find the coordinates of the centre of mass of the system.
 - (c) Derive the Lagrangian equation for simple pendulum.
 - (d) Explain the Kepler's laws of planetary motion.
- Q 5.** Attempt any **Four** of the following. (12)
- (a) Explain the Newton's laws of motion.
 - (b) Write a short note on generalized coordinates.
 - (c) With suitable diagram, explain phase space.
 - (d) A body is projected at such an angle that the horizontal range is three times the maximum height. Find the angle of projection.
 - (e) Differentiate between inertial and non inertial frames of reference.
 - (f) Explain the term 'degrees of freedom'.

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