QK-5703

M.A./M.Sc. (Sem.-I) Examination, December-2023

MATHEMATICS

PAPER – MATH-1C3

Mechanics

Time allowed : **Three Hours**

Maximum Marks : **100**

Note : *This question paper contains* ***two*** *sections as under :*

https://pyqielo.com

Section-A

Max. Marks-20

This section will have 10 questions, having 02 questions from each unit with no internal choice. Answer in about 20 words. All questions will have equal marks. (10×02=20)

Section-B

Max. Marks-80

This section will have 10 questions, having 02 questions from each unit. one question to be attempted from each unit. Word limit approximately 400-500 words. Questions may have sub divisions. All questions will have equal marks. (16×05=80)

https://pyqlab.com

SECTION - A

1 (i) Define moment of inertia.
(ii) What is principle axis ?
(iii) Define principle of angular momentum.
(iv) What is the time of a complete oscillation of the compound pendulum ?
(v) Define Rheonomic system.
(vi) Define generalized potential.
(vii) Define Hamilton's variables.
(viii) Show that the moment P_i is conserved if $[H, P_i] = 0$ where H-represent Hamiltonian.
(ix) Define Polsson's Bracket.
(x) State Jacobi-Poisson theorem.

SECTION - B

UNIT - I

2 Determine the moment of inertia of a circle of diameter d about its diameter axis.

OR

Show that *M. I.* of a right solid cone whose height is h and radius of its base is a is $\frac{3M}{20}\left[a^2 + 4h^2\right]$ about a line passing through the vertex parallel to its base.

UNIT - II

3 A rigid body is rotating about a fixed axis then find the moment of the effective forces about the axis of rotation.

OR

Derive Euler equation of motion for rotating rigid body.

UNIT - III

4 Use Lagrange's equations to find the equation of motion of a simple pendulum.

OR

Derive an expression for kinetic energy in terms of generalized coordinates.

UNIT - IV

5 Deduce Euler's dynamical equation of a rigid body moving about a fixed point.

OR

Derive Hamilton canonical equations.

UNIT - V

6 State and prove the principle of least action for a conservative holonormic system.

OR

Explain with the help of an example, the method of separation of variable in Hamilton-Jacobi equation.