

18AA1903

M. Sc. EXAMINATION, 2020

(First Semester)

(C Scheme) (Re-appear Only)

MATHEMATICS

MAT505C

Mechanics

Time : 3 Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *one* question from each Unit and the compulsory question.

(Compulsory Question)

1. (a) Define Holonomic, Non-holonomic, Scleronomic and Rheonomic system.
(b) Define generalized force.
(c) State Donkin theorem.
(d) Define Hamilton action, Cyclic co-ordinate and Hamilton Principle.
(e) Define Poisson bracket, Lagrange bracket and Canonical transformation.

Unit I

2. (a) Prove that there are in general three mutually perpendicular axes through a given point O of a rigid body.
(b) Explain momental ellipsoid.

3. (a) Show that for a two-dimensional mass distribution, one of the principal axes at O is inclined at an angle θ to x-axis through O when $\tan 2\theta = \frac{2F}{B-A}$. A, B and F have their usual meaning.
- (b) Find an equimomental system of particle for a uniform rod AB of mass M.

Unit II

4. (a) Derive K. E. as quadratic function of velocities.
- (b) Derive Hamilton canonical equation in cylindrical co-ordinate system.
5. (a) Explain Poincare carton integral invariant.
- (b) Derive Jacobi equations.

Unit III

6. (a) State and prove Hamilton-Jacobi equation.
- (b) Explain method of separation of variable.
7. (a) Discuss condition of canonical character of a transformation in terms of Poisson brackets.
- (b) Explain invariance of Lagrange brackets under canonical transformation.

Unit IV

8. Explain attraction and potential of a disc.
9. (a) Derive surface and solid harmonic.
- (b) The potential outside a certain cylindrical boundary is zero and inside it is :

$$V = x^3 - 3xy^2 - ax^2 + 3ay^2$$

Find the distribution of matter.