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AA-313

M. Sc. EXAMINATION, May 2017

(First Semester)

(Re-appear Only)

MAT-505-B

MATHEMATICS

Mechanics

Time : 3 *Hours*] [*Maximum Marks :* 100

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 *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Prove that there are in general three mutually perpendicular axes through a given point O of a rigid body. **10**

(b) Find an equipmental system of particle for a uniform rod AB of mass M. **10**

2. (a) Derive K.E. as a quadratic function of velocities. **10**

(b) Prove that in a simple dynamical system T + V = constant. **10**

Unit II

3. (a) State and prove Donkin's theorem. **10**

(b) Derive Hamilton canonical equations with the help of Lagrangian. **10**

4. (a) State and prove Poisson's Identity. **10**

(b) Explain Poincare carten Integral Invariant. **10**

Unit III

5. (a) Derive Hamilton Jacob equations. **10**

(b) State and prove Jacobi theorem. **10**

6. (a) Explain condition for canonical character of a transformation in terms of Lagrange bracket. **10**

(b) Show that the transformation $Q = \log\left(\frac{1}{q}\sin p\right)$ $P = q \cot p$ is canonical. Show that the generating function is :

$F = e^{-\theta}(1 - q^2e^{2\theta}) + q \sin (qe^{\theta})$. **10**

Unit IV

7. Explain attach on and potential of a uniform rod. **20**

8. Derive Laplace and Poisson's equation for the potential. **20**