Subject : Mathematics

Teacher name : Archana Jain Semester 3rd

Name of the Paper : paper 2

Class: MSc(Mathematics)

November 2020

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| Motivating problems of calculus of variations: shortest distance, Minimum surface of revolution, Brachistochrone problem, Isoperimetric problem, Geodesic. Fundamental Lemma of calculus of variation. Euler’s equation for one dependent function of one and several independent variables, and its generalization to (i) Functional depending on ‘n’ dependent functions, (ii) Functional depending on higher order derivatives. Variational derivative, invariance of Euler’s equations, natural boundary conditions and transition conditions, Conditional extremum under geometric constraints and under integral constraints . Variable end points. |

December 2020

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| Free and constrained systems, constraints and their classification. Generalized coordinates. Holonomic and Non-Holonomic systems. Scleronomic and Rheonomic systems. Generalized Potential, Possible and virtual displacements,ideal constraints. . Lagrange’s equations of first kind, Principle of virtual displacements D’Alembert’s principle, HolonomicSystems independent coordinates, generalized forces, Lagrange’s equations of second kind. Uniqueness of solution. Theorem on variation of total Energy. Potential, Gyroscopic and dissipative forces, Lagrange’s equations for potential forces equation for conservative fields. |

January2021

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| Hamilton’s variables. Don kin’s theorem. Hamilton canonical equations. . Routh’s equations. Cyclic coordinates Poisson’s Bracket. Poisson’s Identity. Jacobi-Poisson theorem. Hamilton’s Principle, second form of Hamilton’s principle. Poincare-Carton integral invariant. Whittaker’s equations. Jacobi’s equations. Principle of least action |

February 2021

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| Canonical transformations, free canonical transformations, Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables for solving Hamilton-Jacobi equation. Testing the Canonical character of a transformation. Lagrange brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets. Simplicial nature of the Jacobian matrix of a canonical transformations. Invariance of Lagrange brackets and Poisson brackets under canonical transformations. |