



ED-613

M.A./M.Sc. 3rd Semester
Examination, March-April 2021

MATHEMATICS

Paper - II

Partial Differential Equations and
Mechanics - I

Time : Three Hours] [*Maximum Marks* : 80

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (a) State and prove the symmetry of Green's function.
- (b) State and prove the Poisson formula for half-space.
- (c) State and prove the mean value formula for Laplace equation.

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Unit-II

2. (a) Derive the fundamental solution for heat equation.
- (b) Obtain the solution for $n = 2$ of wave equation by spherical means.
- (c) State and prove the Euler's-Poisson-Darboux equation for wave equation.

Unit-III

3. (a) Derive Kinetic energy in terms of generalized co-ordinates.
- (b) State and prove the Donkin's theorem.
- (c) Derive Lagrange's equation of first kind.

Unit-IV

4. (a) Prove that the Poisson identity
 $[u, (v, w)] + [v, (w, u)] + [w, (u, v)] = 0$
- (b) Find the shortest line on the surface of the sphere.
- (c) Derive Euler's equation for one dependent variable.

Unit-V

5. (a) Find the attraction of a uniform circular disc, of radius a and small thickness k , at a point p on the axis of the disc at a distance p from its centre.

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- (b) Find the potential of a thin uniform spherical shell at any point.
 - (c) Show that a family of right circular cones with common axis and vertex is a possible family of equipotential surfaces and find the potential function.
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