

**M.Sc. (Final)**

**Paper IV : Integral Transforms and Integral Equations**

- Unit 1** Laplace transform – Definition and its properties, Rules of manipulation, Laplace transform of derivatives and integrals.
- Unit 2** Properties of inverse Laplace transform, Convolution theorem and Complex inversion formula.
- Unit 3** Solution of ordinary differential equation with constant and variable coefficients by Laplace transform. Application to the solution of simple boundary value problems by Laplace transform.
- Unit 4** Fourier transform – Definition and properties of Fourier sine, cosine and complex transforms, Convolution theorem, Inversion theorems, Fourier transform of derivatives.
- Unit 5** Mellin transform – Definition and elementary properties, Mellin transform of derivatives and integrals, Inversion theorems, Parseval's theorem.
- Unit 6** Infinite Hankel transform – Definition and elementary properties, Hankel transform of derivatives, Inversion theorem, Parseval's theorem.
- Unit 7** Application to the solution of simple boundary problems by Fourier, and infinite Hankel transforms.
- Unit 8** Linear Integral Equations – Definition and classification, Conversion of initial and boundary value problems to an integral equation. Eigen values and Eigen functions, solution of homogenous Fredholm integral equations second kind with separable kernels.

- Unit 9** Solution of general Fredholm integral equation of second kind with separable kernels. Solution of Volterra integral equations of second kind with convolution type kernels by Laplace transform. Solution of singular integral equations by Fourier transform.
- Unit 10** Solution of Fredholm and Volterra integral equations of second kind by methods of successive substitutions and successive approximations. Resolvent kernels and its results. Conditions of uniform convergence and uniqueness of series solution.
- Unit 11** Integral equations with symmetric kernels – Orthogonal system of functions, Fundamental properties of eigen values and eigen functions and bilinear form, Hilbert-Schmidt theorem. Solution of Fredholm integral equation of second kind by using Hilbert-Schmidt theorem.
- Unit 12** Classical Fredholm theory – Fredholm theorems, solution of Fredholm integral equation of second kind by using Fredholm first theorem.

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