Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 07

M.Sc Mathematics (Sem.–1)

MATHEMATICAL METHODS

Subject Code : MSM-105-18

M.Code : 75133

Date of Examination : 14-01-23

Time : 3 Hrs. **Max. Marks : 70**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION - B & C have THREE questions each.**
3. **Attempt any FOUR questions from SECTION B & C carrying FIFTEEN marks each.**
4. **Select atleast TWO questions from SECTION - B & C each.**

SECTION-A

1. a) What are the properties of Laplace transform?

   b) State Parseval's inequality.

   c) Explain the types of Volterra integral equations.

   d) Explain degenerated kernel.

   e) What is separable kernel and give its formula?

SECTION-B

2. Find the Fourier transform of the following function:

$$f(x) = \begin{cases} 1, & |x| \le a \\ 0, & |x| > a \end{cases}$$

Hence evaluate $\int_{-\infty}^{\infty} \frac{\sin \beta a \cos \beta x}{\beta} d\beta$.

3. State and prove convolution theorem for Laplace transform.

4. Write the algorithm for the Fast Fourier transform.

SECTION-C

5. Transform the initial-value problem $y'' + y = 0$ with $y(0) = 0$, $y'(0) = 1$ into an equivalent integral equation.

6. Solve the integral equation using the method of successive approximation

$$u(x) = x - \int_0^x (x-t)\, u(t)\, dt$$

7. Find the eigen values and eigen functions of the integral equation

$$u(x) = \lambda \int_0^{2\pi} \sin(x-t)\, u(t)\, dt$$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.