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

Total No. of Questions : 11

M.Sc. (Mathematics) (2018 Batch) (Sem.–1)

# MATHEMATICAL METHODS

Subject Code : MSM-105-18

M.Code : 75133

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. Find L (f (t)) if f (t) is periodic with $2\pi$, where

$$f(t) = \begin{cases} \cos t, & 0 \le t \le \pi \\ 0, & \pi \le t \le 2\pi \end{cases}$$

2. Find inverse Laplace of $\frac{2}{s^5 - 4s^3}$.

3. Define all kinds of fredholm's Integral equation.

4. What is Fourier transform.

5. Define Resolvent Kernel.

## SECTION-B

6. State and prove Convolution theorem for Laplace transform.

7. Solve $\frac{dx}{dt} - \frac{dy}{dt} - x - 2y = e^t$ and $\frac{dx}{dt} - 2\frac{dy}{dt} - x - y = e^t$ using Laplace transform

Given x (0) = 1, y (0) = 2.

8. Solve the differential equation $\frac{\partial y}{\partial t} = k\frac{\partial^2 y}{\partial x^2}$, $x > 0, t > 0$ using Fourier transforms, subject to conditions,

(i) $y = \phi$, when $x = 0, t > 0$ (ii) $y = 0$, when $t = 0, x > 0$

SECTION-C

9. Derive a solution for integral equation using Successive Approximation, also show that it is unique solution.

10. Obtain Fredholm integral equation of second kind corresponding to the boundary value problem :

$$\frac{d^2\phi}{dx^2} + \lambda x\phi = 0; \quad \phi(0) = 0, \quad \phi(1) = 0$$

Also, recover the boundary value problem from the integral equation.

11. Solve the integral equation $\phi(x) = x + \lambda\int_0^{\pi}(1 + \sin x \sin t)\phi(t)dt$

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