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Total No. of Pages : 02

Total No. of Questions : 07

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. a) Find Laplace transform of $3t - 5$.
b) Write a short note on Fredholm integral equations.
c) Find Inverse Laplace transform of $\frac{1}{s^4}$.
d) Find Fourier Transformation of $f(x)$, where
$$f(x)=\begin{cases} e^{inx}, & a<|x|<b \\ 0, & xb. \end{cases}$$
e) Show that the function $\phi(x) = 1 - x$ is a solution of the integral equation
$$\int_0^x e^{(x-\xi)} d\xi = x.$$

SECTION-B

2. Solve with the help of Laplace Transformation :

$$\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} - \frac{dy}{dx} + y = 8te^{-t}$$

If $\frac{d^2y}{dx^2} = y = 0, \frac{dy}{dx} = 1$ when $t = 0$.

3. Solve with the help of Laplace Transformation

$$\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$$

4. Find the Fourier sine transform of

$$f(x) = \frac{1}{x(x^2 + a^2)}$$

SECTION-C

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

$$\frac{d^2\phi}{dx^2} + x\phi = 1$$

With conditions $\phi(0) = 1$, $\phi(1) = 1$. Also, recover the boundary value problem from the integral equation you obtain.

6. Solve the following integral equation :

$$\phi(x) = 1 + \lambda \int_0^1 (1 - 3x\xi) \phi(\xi) d\xi.$$

For what values of λ the solution does not exist?

7. Determine the eigen values and eigen function for the following homogeneous integral equation :

$$\phi(x) = \lambda \int_0^{\pi} \{\cos^2(x) \cos(2\xi) + \cos^3(x) \cos(3\xi)\} \phi(\xi) d\xi.$$

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.