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# MT-609

## MA/MSC Mathematics (MAMT/MSCMT)

### (Integral Equations)

Examination, June 2025

Time : 2:00 Hrs.                    Max. Marks : 70

*Note* **:–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

### Section–A

### (Long Answer Type Questions)      2×19=38

*Note* **:–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Convert $y'' + xy = 1$, $y(0) = 0 = y'(0)$ into Volterra integral equation.

2. Solve :

$$g(s) = s + \lambda \int\limits_0^1 (st^2 + s^2 t)dt$$

3. Show that iterated kernels of a symmetric kernel are symmetric.

4. Solve :

$$y(x) = x^2 - \frac{e}{2} + \frac{1}{2}\left(1 + \int\limits_0^1 y(t)dt\right)$$

5. Solve :

$$y(x) = e^{x^2} + \int\limits_0^x e^{x^2 - t^2} y(t)dt$$

**Section–B**

**(Short Answer Type Questions)**      4×8=32

*Note* :– Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Show that $u(x) = 1$ is a solution of :

$$u(x) + \int_0^1 x(e^{xt} - 1)u(t)dt = e^x - x$$

2. Discuss Initial Value Problem with example.

3. Show that Kernel of :

$$u(x) - \lambda \int_0^1 t(3x - 2)u(t)dt = 0$$

Is not symmetric.

4. Find $R(x, t; \lambda)$ if $K(x, t) = 1$.

5. Solve :

$$u(x) = \sin x + 2\int_0^x e^{x-t}u(t)dt$$

6. Discuss various kinds of Fredholm integral equations.

7. Show that $D(x, t; \lambda) = K(x, t)$ provided $K(x, t) = \sin x \cos t$.

8. Find $B_1(x, t)$ if $K(x, t) = 2x - t$.

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