

Roll No. _____

22/2464**M.A./M.Sc. (Third Semester)****Examination, 2022****MATHEMATICS****Third Paper****(Partial Differential Equations and Integral Equations)***Time : 1:30 Hours* [*Maximum Marks : 100*

Note : Attempt questions of **Section-A** and **Section-B** as directed. The answer to short questions should not exceed 150 words and the answer to long questions should not exceed 350 words each.

Section-A**(Short Answer Type Questions)**

Note : Attempt any **five** questions. $10 \times 5 = 50$

- I. Find the partial differential equation by eliminating the arbitrary functions f and g from

$$y = f(x-at) + g(x+at).$$

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- II. Find the Complete integral of the partial differential equation $p^2 + q^2 = m^2$, where m is constant and symbols have in their usual meaning. Does the singular solution exist of $p^2 + q^2 = m^2$.
- III. Find $f(y)$ such that the total differential equation $\frac{(yz+z)}{x} dx - zdy + f(y) dz = 0$ is integrable.
- IV. Classify the partial differential equation $\frac{\partial^2 z}{\partial x^2} + x \frac{\partial^2 z}{\partial y^2} = 10$.
- V. Solve the partial differential equation $(D^4 - 2D^3D' + 2DD'^3 - D'^4)z = 0$.
- VI. Prove that Volterra integral equation is special case of Fredholm integral equation.
- VII. Classify the integral equation $u(x) = x - \frac{x^3}{6} + \int_0^x (x-t)u(t) dt$
Prove that $u''(x) = -x + u(x)$.

VIII. Find the solution of integral equation

$$g(x) = x + \int_0^1 xt^2 g(t) dt.$$

Section-B

(Long Answer Type Questions)

Note : Attempt any **two** questions. $25 \times 2 = 50$

1. Find the equation of integral surface of the differential equation

$$2y(z-3)p + (2x-z)q = y(2x-3),$$

which pass through the circle

$$z=0, x^2+y^2=2x.$$

2. Reduce the partial differential equation

$$\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$$

in to Canonical form.

3. Obtain the general solution of partial differential equation <https://www.mgkvponline.com>

$$(D^2 - 3DD' + 2D'^2)z = e^{x+y} + \cos(x+2y)$$

4. Find the solution of Laplace equation in Cylindrical Co-ordinates.

5. Find the solution of homogeneous Fredholm integral equation of second kind with separable kernel

Also, find the resolvent kernel of Volterra integral equation with $k(x,t) = 1$.

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