

**2021**  
**B.A./B.Sc.**  
**Third Semester**  
CORE – 7  
**MATHEMATICS**  
*Course Code: MAC 3.31*  
(PDE & Systems of ODE)

**PART-B**  
Total Mark: 30

*Answer the following questions.*

6×5=30

1. Find the solution of the Cauchy problem:

$$uu_x - uu_y = u^2 + (x + y)^2, \text{ with } u = 1 \text{ on } y = 0$$

2. Obtain the general solution of the equation:

$$x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy} + xy u_x + y^2 u_y = 0$$

3. Determine the solution in detail of the initial-value problem:

$$u_{tt} - c^2 u_{xx} = 0, \quad u(x, 0) = x^3, \quad u_t(x, 0) = x$$

4. Discuss, in detail, the vibrating string problem.

5. Use the method of successive approximations to find the first three members  $\phi_1, \phi_2, \phi_3$  of a sequence of functions that approaches the exact solution of the problem:

$$\frac{dy}{dx} = x + y^2, \quad y(0) = 0$$

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