

Roll No. ....

**Y – 3180**

**M.A/M.Sc. (Fourth Semester) EXAMINATION, May/June-2021**

**MATHEMATICS**

Paper – 401

**PARTIAL DIFFERENTIAL EQUATION**

*Time : Three Hours*

*Maximum Marks : 85*

*Minimum Pass Marks : 29*

**Note**—Attempt *all* questions.

**Unit-I**

1. Find the complete integral of  $(p^2 + q^2) y = q z$  17

**Unit-II**

2. Reduce the following equation to a canonical form and hence solve it. 17

$$y u_{xx} + (x + y) u_{xy} + x u_{yy} = 0$$

**Unit-III**

3. Solve the following Neumann problem for a rectangle 17

$$\nabla^2 u = 0 \quad 0 \leq x \leq a, \quad 0 \leq y \leq b$$

Boundary conditions

$$u_x(0, y) = u_x(a, y) = 0$$
$$u_y(x, 0) = 0, \quad u_y(x, b) = f(x).$$

**Unit-IV**

4. A uniform rod of length  $L$  whose surface is thermally insulated is initially at temperature  $\theta = \theta_0$ . At time  $t = 0$ , one end is suddenly cooled to  $\theta = 0$  and subsequently maintained at this temperature, the other end remains thermally insulated. Find the temperature distribution  $\theta(x, t)$ . 17

**Unit-V**

5. A stretched string of finite length  $L$  is held fixed at its ends and is subjected to an initial displacement  $U(x, 0) = U_0 \sin \frac{(\pi x)}{L}$ . The string is released from this position with zero initial velocity. Find the resultant time dependent motion of the string.

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