

## PARTIAL DIFFERENTIAL EQUATION

Paper - V : Semester-II

[Maximum Marks : 36]

Time Allowed : 3 Hours]

**Note :** The candidates are required to attempt two questions each from Section A and B carrying 5½ marks each and the entire Section C consisting of 7 short answer type questions carrying 2 marks each.

### Section - A

1. (a) Solve :  $(3x - 4y)p + (2z - 4x)q = x^2 - y^2$ . 3  
 (b) Solve :  $z = px + qy + \log(pq)$ . 2½
2. (a) Form a differential equation by eliminating arbitrary function:  $f\left(\frac{x}{y}, \frac{y}{z}\right) = 0$ . 3  
 (b) Find the equation of the family of surface which cuts orthogonally the cones of family  $x^2 + y^2 + z^2 = \alpha xy$ ,  $\alpha$  is parameter. 3  
 (b) Find singular solution of :  $z = px + qy + 3(pq)^{1/3}$  2½
4. (a) Form a differential equation by eliminating arbitrary function:  $f(lx + my + nz, x^2 + y^2 + z^2) = 0$ . 3  
 (b) Apply Charpit's method to find complete solution of  $yzp^2 = q$ . 2½

### Section - B

5. (a) Solve  $r + t = \sin mx \sin ny$ . 3  
 (b) Solve  $r + s - 6t = x^2 \cos(x + y)$ . 2½
6. The temperature at the end of a bar 100 cm long with insulated sides is kept at 0°C and 100°C until steady state conditions is prevail. The two ends are then suddenly insulated and kept so. Find the temperature distribution. 5½
7. A tight stretched string of length  $l$  has its ends fastened at  $x = 0, x = l$ . The mid point of string is then taken to a height  $h$  and then released from rest in that position. Find the displacement of a point of the string at time  $t$  from the instant of release. 5½
8. Find the solution of  $\frac{\partial y}{\partial t} = k \frac{\partial^2 y}{\partial x^2}$  such that : 5½  
 (a)  $y$  is not infinite when  $x \rightarrow 0$   
 (b)  $\frac{\partial y}{\partial x} = 0$  when  $x = 0$  and  $x = l$   
 (c)  $y = \mu$  when  $t = 0$  for  $0 < x < l$ .

### Section - C

9. (i) Find differential equation of all sphere of fixed radius having centres in  $xy$ -plane.  
 (ii) Explain method to solve Lagrange's linear equations.  
 (iii) Solve  $px + qy = z$ .  
 (iv) Discuss in brief solution of 2nd order partial differential equation by separable variable.  
 (v) Find general solution of  $(D_x + 1)(D_x + D_y - 1)z = 0$ .  
 (vi) Find Particular integral of  $r = q = e^{x+y}$ .  
 (vii) Classify the partial differential equation  $u_{xx} + u_{yy} + u_{zz}$ .

207-11