PARTIAL DIFFERENTIAL EQUATIONS - V

Semester - II

Time : Three Hours] [Maximum Marks : 36

Note : Attempt *five* questions in all. Select *two* questions each from Section A and B while Q. no. 9 of Section C is Compulsory.

Section - A

1. (a) Discuss the existence of integral surface of $2p + 3q + 8z = 0$ which contains the curve $\Gamma : z = x^2$ on the line $2y = 1 + 3x$. 3
   (b) Find the complete solution of $u^2 = pqxy$. 2.5
2. (a) Discuss the method for finding a complete solution of the equation of the tyep F (u, p, d)=0. 3
   (b) Show that all the characteristicv curve of the partial differenial equation $(2x + u) u_x + (2y + u) u_y = u$ through the point (1, 1) are given by the same straight line $x - y = 0$. 2.5
3. (a) Solve using Charpits's method $q + xp = p^2$. 3
   (b) Find a series solution around $x_0 = 0$ for the following differential equation : $y'' - xy = 0$. 2.5
4. (a) Find the general solution of the partial differential equation $u_x^2 x + u_y^2 y - u = 0$. 3
   (b) Solve $u^2 + pq - 4 = 0$. 2.5

Section - B

5. (a) Solve the partial differential equation $u_{tt} - c^2 u_{xx} = c^{-x} \sin t$. 3
   (b) Solve : $25u_{xx} - 40u_{xy} + 16u_{tt} = 0$ 2.5
6. (a) Solve: $4u_{xx} - 4u_{xy} + u_{tt} = 16\log(x + 2y)$. 3
   (b) A rod of length *l* with insulateed sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0°C and are kept at that temperature. Find the temeprature function u (x, t) 2.5
7. (a) Solve : $u_{xx} + u_{yy} = 0$ 3
   (b) Solve the equation $z_{xx} - 2_{zs} + z_y = 0$ by method of seperation of variables. 2.5
8. (a) State wave equation and give D'Alembert's solution of wve equation. 3
   (b) Solve : $u_{xx} + u_{xy} - 6_{yy} \cos x$. 2.5

Section - C
(Compulsory Questions)

9. Attempt all the following :
   (a) Classify the PDE $zp + q = 0$.
   (b) Examine whether the following partial differential equation is hyperbolic, parabolic or elliptic: $u_{xx} + yu_{yy} = 0$.
   (c) Define a quasi linear PDE with example.
   (d) Find the general solution of $2u_x - 3u_y = \cos x$.
   (e) Solve $p = e^q$.
   (f) Solve $xp + yq = 3z$.
   (g) Form the partial differential equation from $z = xf_1(x + 1) + f_2(x + t)$. (7×2=14)