PGIIS-N 1005 A-2K14

M.Sc. IInd Semester (CBCS) Degree Examination
Mathematics
(Partial Differential Equations)
Paper - HCT 2.1
(New)

Time :3 Hours   Maximum Marks : 80

Instructions to Candidates:

    1)   Answer any five questions.

    2)   All questions carry equal marks.

1.   a)   Define the following with examples.

       i)   Linear equation.

       ii)   Semi-linear equation.

       iii)   Quasi-linear equation.

       iv)   Non-linear equation.   **(8)**

   b)   Derive partial differential equation by the elimination of arbitrary function F from the equation F(u,v)=0 where u & v are functions of x, y and z.   **(8)**

2.   a)   Find the equation of the integral surface of the differential equation. *2y(z-3) p+ (2x-z)q = y(2x-3)* which pass through the circle *z=0, $x^2+y^2=2x$*   **(8)**

   b)   Find the surface which intersect the surfaces of the system z(x+y)= c(3z+1) orthogonally and which passes through the circle *$x^2+y^2=1$, z=1.*   **(8)**

3.   a)   Reduce the equation $\frac{\partial^2 z}{\partial x^2}+x^2\frac{\partial^2 z}{\partial y^2}=0$ to canonical form.   **(8)**

   b)   Explain separation of variables method for solving the partial differential equation.

      Rr+Ss+Tt+Pp+Qq+Zz = F.   **(8)**

4.   a)   Derive the necessary condition for the families of equipotential surfaces.   **(8)**

   b)   Show that the surfaces $x^2 + y^2 + z^2 = Cx^{\frac{2}{3}}$ can form a family of equipotential surfaces and find the general form of the corresponding potential function.   **(8)**

5. a) Explain elementary solutions of the one dimensional wave equation. **(8)**

b) Obtain the solution of the one-dimensional wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$ by using the method of separation of variables. **(8)**

6. a) Solve the diffusion equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{k} \frac{\partial u}{\partial t}$ using variable separable method. **(8)**

b) Obtain the solution of the two dimensional diffusion equation $\frac{\partial^2 \theta}{\partial x^2} + \frac{\partial^2 \theta}{\partial y^2} = \frac{1}{k} \frac{\partial \theta}{\partial t}$ **(8)**

7. a) Derive Jacobi's method of obtaining solution of non-linear partial differential equations of order one with three independent variables. **(10)**

b) Find the complete integral of the following.

i) $q^2 y^2 = z(z-px)$

ii) $z^2(p^2+q^2) = x^2+y^2$ **(6)**

8. Solve the following equations

a) $r+4s+t+(rt-s^2)=2$ **(8)**

b) $r+3s+t+(rt-s^2)=1$ **(8)**