PGIIS-O 1011 A-2K12

M.A./M.Sc. Second Semester Degree Examination

MATHEMATICS — Paper – 2.4

Partial Differential Equations

(Old)

Time : 3 Hours] [Max. Marks : 80

Instructions : *1) Answer any **five** questions.*

*2) All questions carry **equal** marks.*

1. (a) Write note on classifications of second order partial differential equations. **(10)**

   (b) Explain the examples of partial differential equations. **(6)**

2. (a) Explain on the non-homogeneous wave equation. **(8)**

   (b) Explain elementary solutions of the one-dimensional wave equation. **(8)**

3. (a) Explain the method of separation of variables for solving the partial differential equation, $Rr + Ss + Tt + Pp + Qq + Zz = F$. **(8)**

   (b) By separating the variables, solve the one dimensional diffusion equation $\frac{\partial^2 z}{\partial x^2} = \frac{1}{K}\frac{\partial z}{\partial t}$. **(8)**

4. (a) State and prove Green's theorem. **(8)**

   (b) Explain the characteristic boundary value problem. **(8)**

5. (a) Explain elementary solutions of the diffusion equation. **(8)**

   (b) The faces $x = 0, x = a$ of an infinite slab are maintained at zero temperature. The initial distribution of temperature in the slab is described by the equation $\theta = f(x), (0 < x < a)$. Determine the temperature at a subsequent time t. **(8)**

6. (a) Explain the method of spherical means for wave equation. **(8)**

   (b) Prove uniqueness theorem for heat equation. **(8)**

7. (a) Derive Charpit's method. **(8)**

(b) Explain the Jacobi's method of solving the partial differential equation $f(x_1, x_2, x_3, P_1, P_2, P_3) = 0$. **(8)**

8. Solve the following non linear partial differential equations :

(a) $2S + (rt - S^2) = 1$ **(8)**

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