SX-S 450

ANDHRA UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.A/M.SC MATHEMATICS
IV-SEMESTER 2006-07 AB

M 402 PARTIAL DIFFERENTIAL EQUATIONS

Unit I:

Introduction to Partial differential equations – Definitions; Examples – Linear equations, Nonlinear equations, Linear systems, Nonlinear systems; Strategies for studying PDE – well posed problems, classical solutions, weak solutions and regularity, Typical difficulties (*Only short answer questions to be asked from this portion*) Transport equation – Initial value problem, Nonhomogeneous problem Laplace 's equation – Physical interpretation; Fundamental solution - Derivation of fundamental solution, Poisson's equation; Mean value formulas; Properties of harmonic functions- strong maximum principle, uniqueness, regularity, Local estimates for harmonic functions, Liouville's theorem. Harnack's inequality, Green's function – Derivation of green's function, Green's function for a half space, Green's function for a ball; Energy methods – Uniqueness, Dirichlet's principle

Chapter 1 – sections 1.1 – 1.3. Chapter 2 – sections 2.1, 2.2

Unit II:

Heat Equation – physical interpretation; Fundamental solution – Derivation of the fundamental solution, Initial value problem, Nonhomogeneous problem; Mean value formula; Properties of solutions – strong maximum principle, uniqueness, regularity, Local estimates for the solutions of the heat equation; Energy methods – uniqueness, Backward uniqueness.

Chapter 2 – section 2.3

Unit III:

Wave equation – Physical interpretation; Solution by spherical means – Solution for n = 1, d'Alembert's formula, Spherical means, Solution for n = 3,2 Kirchhoff's and Poisson's formulas, Solution for odd n, Solution for even n; Nonhomogeneous problem; Energy methods – uniqueness, Domain of dependence.

Chapter 2 – section 2.4

Unit IV:

Nonlinear first order Partial differential equation – Complete integrals, new solutions from envelops; Characteristics – Derivation of characteristic ODE; Examples for liner, quasilinear, fully