King Fahd University of Petroleum and Minerals Department of Mathematics and Statistics

Math 572 , Term: 142

Assignment (6)
Instructor: Dr. Faisal Fairag

Due Sunday 14/4/2015

- (1) Use <u>Matrix stability method</u> to analyze the stability of the Crank-Nicolson scheme (equation (9.25) page 142). [Under what condition this scheme is stable]
- (2) Consider the following scheme

$$\frac{U_{j}^{n+1} - U_{j}^{n-1}}{2k} = \frac{U_{j+1}^{n} - 2U_{j}^{n} + U_{j-1}^{n}}{h^{2}}$$

which approximate the parabolic equation $u_t = u_{xx}$

Use Von Neumann Stability method (Fourier method) to analyze the stability of this scheme

- (3) Problem 10.7 page 161 (Prove Theorem 10.6)
- (4) Problem 10.2 part (b) page 159 (FEM)