

NDU

MAT 335 (PDEs)

Exam # 1

Spring 2002

Duration: 55 min

1) Solve the 1-d heat flow problem

$$\begin{array}{ll} \text{PDE: } u_t = \alpha^2 u_{xx} & 0 < x < 1, \quad 0 < t < \infty \\ \text{BC: } u(0, t) = 0 & 0 < t < \infty \\ \text{BE: } u(1, t) = 0 & 0 < t < \infty \\ \text{IC: } u(x, 0) = \phi(x) & 0 \leq x \leq 1 \end{array}$$

2) Solve the IBVP

$$\begin{array}{ll} \text{PDE: } u_t = u_{xx} & 0 < x < 1, \quad 0 < t < \infty \\ \text{BC: } u(0, t) = 0 & 0 < t < \infty \\ \text{BC: } u(1, t) = \cos t & 0 < t < \infty \\ \text{IC: } u(x, 0) = x & 0 < x < 1 \end{array}$$

By (a) transforming it to one with homogeneous BCs

(b) solving the resulting problem by expanding it in terms of eigenfunctions