NDU **MAT 335 (PDEs)** **Exam # 1** **Fall 2001 – 2002**

Duration: 60 min

1) **(35%)** Use the method of separation of variables to find the solution of the 1–dimensional heat flow IBVP in a finite length rod:

PDE: $u_t = u_{xx}$ $\quad 0 < x < 1, \quad 0 < t < \infty$

BCs: $u_x(0,t) = u_x(1,t) = 0$ $\quad 0 < x < 1, \quad 0 < t < \infty$

IC : $u(x,0) = \cos \pi x$ $\quad 0 \le x \le 1, \quad 0 < t < \infty$

2) **(30%)** Use the Fourier Transform to find the solution of the 1–dimensional heat flow IVP in an infinite rod:

PDE: $u_t = \alpha^2 u_{xx}$ $\quad -\infty < x < \infty, \quad 0 < t < \infty$

IC : $u(x,0) = \phi(x)$ $\quad -\infty < x < \infty$

3) **(35%)** Use the Laplace Transform to solve the IBVP:

PDE: $u_{xx} - u_{tt} = -\sin \pi x$ $\quad 0 < x < 1, \quad 0 < t < \infty$

ICs : $u(x,0) = u_t(x,0) = 0$ $\quad 0 \le x \le 1, \quad 0 < t < \infty$

BCs: $u(0,t) = u(1,t) = 0$ $\quad 0 < t < \infty$

NDU **MAT 335 (PDEs)** **Exam # 1** Spring 2002

Duration: 55 min

1) Solve the 1–d heat flow problem

PDE: $u_t = \alpha^2 u_{xx}$ $\quad 0 < x < 1, \quad 0 < t < \infty$

BC: $u(0,t) = 0$ $\quad 0 < t < \infty$

BE: $u(1,t) = 0$ $\quad 0 < t < \infty$

IC: $u(x,0) = \phi(x)$ $\quad 0 \le x \le 1$

2) Solve the IBVP

PDE: $u_t = u_{xx}$ $\quad 0 < x < 1, \quad 0 < t < \infty$

BC: $u(0,t) = 0$ $\quad 0 < t < \infty$

BC: $u(1,t) = \cos t$ $\quad 0 < t < \infty$

IC: $u(x,0) = x$ $\quad 0 < x < 1$

By (a) transforming it to one with homogeneous BCs

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