工程數學 (四) - 偏微分方程

I. By using the diamond rule, solve the problem of p.140. in text (1). $u(x,t)$ versus x, (2). $u(x,t)$ versus t.

II. Solve the D'Alembert solution by Fourier transform.

III. Solve the D'Alembert solution by Laplace transform.

IV. Solve the PDE

$$u_{tt} = u_{xx}, \quad for \ \ 0 < x < 1, \ \ t > 0$$

with initial conditions

$$u(x,0) = 0, u_t(x,0) = 0$$

and boundary conditions

$$u(0,t) = a(t), u(1,t) = b(t)$$

(1) diamond rule
(2) eigenfunction expansion
(3) quasi-static decomposition method

V. Solve the PDE

$$\rho u_{tt} = -EI u_{xxxx}, \quad for \ \ 0 < x < 1, \ \ t > 0$$

with initial conditions

$$u(x,0) = 0, u_t(x,0) = 0$$

and boundary conditions

$$u(0,t) = a(t), u(1,t) = b(t)$$

$$u_{xx}(0,t) = 0, u_{xx}(1,t) = 0$$

(1) eigenfunction expansion
(2) quasi-static decomposition method
(ref: 陳與洪, 邊界元素法,p.352, Earthquake Enginereing and Structural Dynamics)

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