

邊界元素法期末考1999 by Prof. J. T. Chen

考試時間 — 8:00 to 9:30, June 4, 1999

考試方式 — Closed book

1. Explain the following items. (50%)

- (1). dual integral equations and dual BEM
- (2). Hadamard principal value and Cauchy principal value
- (3). kernel function, fundamental solution and Green's function
- (4). degenerate boundary and degenerate scale
- (5). degenerate kernel and degenerate mode
- (6). direct BEM and indirect BEM
- (7). single, double layer and volume potentials
- (8). use of simple solution and equilibrium test
- (9). two-point function
- (10). spurious eigenvalue, spurious boundary mode and spurious interior mode

2. Given the one-dimensional Laplace problem with the following kernel, represent it by using the degenerate kernel as shown below:

$$U(s, x) = \begin{cases} \frac{1}{2}(x - s), & x > s \\ \frac{1}{2}(s - x), & x < s \end{cases} \quad (1)$$
$$= \begin{cases} \frac{1}{2} \sum_{i=1}^2 a_i(x) b_i(s), & x > s \\ \frac{1}{2} \sum_{i=1}^2 a_i(s) b_i(x), & s > x \end{cases} \quad (2)$$

Please find (4%)

$$\begin{cases} a_1(x) = ? \\ a_2(x) = ? \\ b_1(s) = ? \\ b_2(s) = ? \end{cases}$$

Also, determine $T(s, x)$, $L(s, x)$ and $M(s, x)$ in closed form and degenerate form. (6 %)

3. What are the roles for hypersingularity in BEM ? (more than three roles) (10%)

4. How many indirect BEMs you know ? (5%) How many direct BEMs you know ? (5%)

5. Please write down the symmetry and transpose symmetry properties for the four kernels ($U(s, x)$, $T(s, x)$, $L(s, x)$, $M(s, x)$) in dual formulation. (10 %)

6. In solving the eigenproblems using the complex-valued BEM, the real-part BEM and the MRM, what are their differences and similarities ? (10 %)