班級：_____學號：_____姓名：_____

國立台灣海洋大學河海工程研究所積分方程式特論第五次作業

1. Using BEPO2D Program,

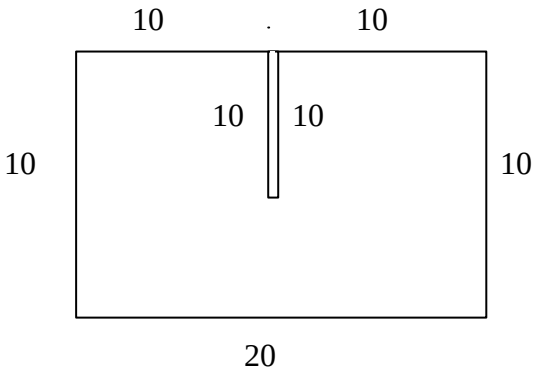
(1) Determine $[U]$, $[T]$, $[L]$, and $[M]$ matrices.

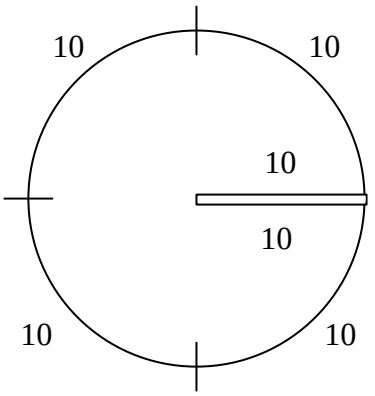
(2) Decompose the four matrices by SVD.

(3) Plot the $\tilde{f}_i$ and $\tilde{y}_i$ for the *i*-th zero singular value and compare with each other for $[U]$, $[T]$, $[L]$, and $[M]$ cases.

(4) Find the generalized inverse of $[U]^{-1}$, $[T]^{-1}$, $[L]^{-1}$, $[M]^{-1}$.

(5) Choosing the following two examples, solve it by *UT* BEM or *LM* BEM.





$$[A]=\begin{bmatrix}\Phi_\ell & \Phi_r\end{bmatrix}\begin{bmatrix}\Sigma_\ell & 0\\ 0 & \Sigma_r\end{bmatrix}\begin{bmatrix}\Psi_\ell^T\\ \Psi_r^T\end{bmatrix}$$

If $\Sigma_r = 0$, we have

$$\begin{cases}[A] = [\Phi_\ell]\,[\Sigma_\ell]\,[\Psi_\ell]^T\\ [A]^{-1} = [\Psi_\ell]\,[\Sigma_\ell]^{-1}\,[\Phi_\ell]^T\end{cases}$$

(6) By using SVD update terms, decompose

$\begin{bmatrix}U\\ L\end{bmatrix}$, $\begin{bmatrix}T\\ M\end{bmatrix}$ and find y.

(7) By using SVD updating documents, decompose

$[U \quad T]$, $[L \quad M]$ and find f.

(8) Truncating the zero singular values due to the degenerate boundary, plot the next zero singular value versus k for the eigenproblem.