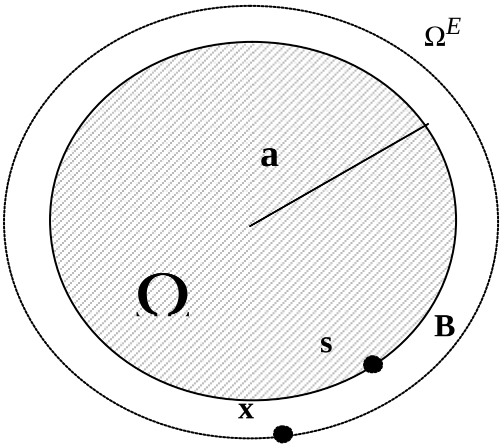
程式 73　Degenerate scale for biharmonic equation (plate problem)



Governing equation:

$$\nabla^4 u(x) = 0, \quad x \in \Omega$$

Essential boundary condition:

$$u(q) = \tilde{u}(q), \quad \frac{\partial u(q)}{\partial q} = \tilde{t}(q)$$

(a) $0 = -\int_B U^E(s,x)v(s)dB(s) + \int_B \Theta^E(s,x)m(s)dB(s) - \int_B M^E(s,x)q(s)dB(s) + \int_B V^E(s,x)u(s)dB(s), \quad x \in \Omega^E$

(b) $0 = -\int_B U_q^E(s,x)v(s)dB(s) + \int_B \Theta_q^E(s,x)m(s)dB(s) - \int_B M_q^E(s,x)q(s)dB(s) + \int_B V_q^E(s,x)u(s)dB(s), \quad x \in \Omega^E$

(c) $0 = -\int_B U_m^q(s,x)v(s)dB(s) + \int_B \Theta_m^q(s,x)m(s)dB(s) - \int_B M_m^q(s,x)q(s)dB(s) + \int_B V_m^q(s,x)u(s)dB(s), \quad x \in \Omega^E$

(d) $0 = -\int_B U_v^q(s,x)v(s)dB(s) + \int_B \Theta_v^q(s,x)m(s)dB(s) - \int_B M_v^q(s,x)q(s)dB(s) + \int_B V_v^q(s,x)u(s)dB(s), \quad x \in \Omega^E$

1. Use the direct BEM to solve the problem and find the degenerate scales.
2. Please fill in the following table.

Formulations (C_2^4)	**Degenerate scales**
(a), (b)	
(a), (c)	
(a), (d)	
(b), (c)	
(b), (d)	
(c), (d)	

References

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2. Chen J. T., Lee C. F., Chen I. L. and Lin J. H., An alternative method for degenerate scale problem in boundary element methods for the two-dimensional Laplace equation, *Engineering Analysis with Boundary Elements*, Vol.26, No.7, pp.559-569. (2002)
3. Chen J. T., Lin J. H., Kuo S. R. and Chiu Y. P., “Analytical study and numerical experiments for degenerate scale problems in boundary element method using degenerate kernels and circulants”, *Engineering Analysis with Boundary Elements*, Vol.25, No.9, pp.819-828. (2001)
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