MuLö

$\boxed{3}$ a) $w(x=0,t) = 0 \Rightarrow B_1 = -B_3$ (1)

$\left.\frac{\partial w}{\partial x}\right|_{(x=0,t)} = 0 \Rightarrow B_2 = -B_4$ (1)

$\cos(.) =: c_{(.)}$
$\sin(.) =: s_{(.)}$
$\cosh(.) =: ch_{(.)}$
$\sinh(.) =: sh_{(.)}$

b) $\left.\frac{\partial w}{\partial x}\right|_{(x=l,t)} = 0 \Rightarrow \lambda \cdot (B_1 sh_{\lambda l} + B_2 ch_{\lambda l} - B_3 s_{\lambda l} + B_4 c_{\lambda l}) = 0$

(1) $B_1 sh_{\lambda l} + B_2 ch_{\lambda l} + B_1 s_{\lambda l} - B_2 c_{\lambda l} = 0$ (1)

$Q(x=l,t) = 0 \Rightarrow \left.\frac{\partial^3 w}{\partial x^3}\right|_{(x=l,t)} = 0 \Rightarrow \lambda^3 (B_1 sh_{\lambda l} + B_2 ch_{\lambda l} + B_3 s_{\lambda l} - B_4 c_{\lambda l}) = 0$

(1) $B_1 sh_{\lambda l} + B_2 ch_{\lambda l} - B_1 s_{\lambda l} + B_2 c_{\lambda l} = 0$ (2)

$$\begin{array}{l} (1)+(2) \\ \\ (1)-(2) \end{array} \quad \begin{bmatrix} sh_{\lambda l} & ch_{\lambda l} \\ s_{\lambda l} & -c_{\lambda l} \end{bmatrix} \begin{bmatrix} B_1 \\ B_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \Bigg\} \text{ (1)}$$

$+sh_{\lambda l} c_{\lambda l} + ch_{\lambda l} s_{\lambda l} = 0$ (1)

$\tanh(\lambda l) + \tan(\lambda l) = 0$ (3) (1)

$\tan(.) =: t_{(.)}$
$\tanh(.) =: th_{(.)}$

c) $\underline{\underline{B_{1_k} = \alpha}}$ $\alpha sh_{\lambda_k l} + ch_{\lambda_k l} B_{2_k} = 0$ $\underline{\underline{B_{2_k} = -\alpha\, th_{\lambda l}}}$

$\underline{\underline{B_{3_k} = -\alpha}}$

Variante 1 $\underline{\underline{B_{4_k} = \alpha\, th_{\lambda l}}}$ (1)

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$\underline{\underline{B_{1_k} = \alpha}}$ $\alpha s_{\lambda_k l} - c_{\lambda_k l} B_2 = 0$ $\underline{\underline{B_{2_k} = \alpha \cdot t_{\lambda l}}}$

$\underline{\underline{B_{3_k} = -\alpha}}$ (1)

Variante 2 $\underline{\underline{B_{4_k} = -\alpha\, t_{\lambda l}}}$

Wegen (3) sind die Varianten 1 und 2 identisch.

(2) $E_k(x) = ch_{\lambda_k x} - th_{\lambda_k l} \cdot sh_{\lambda_k x} - c_{\lambda_k x} + th_{\lambda_k l} \cdot s_{\lambda_k x}$ für Variante 1

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(2) $E_k(x) = ch_{\lambda_k x} + t_{\lambda_k l} \cdot sh_{\lambda_k x} - c_{\lambda_k x} - t_{\lambda_k l}\, s_{\lambda_k x}$ für " 2