In[5]:= `V = -ma * g * la * Cos[qb] - mb * g * (wa * Cos[qb] + lb * Cos[qb])`

Out[5]= $-g\ la\ ma\ Cos[qb] - g\ mb\ (lb\ Cos[qb] + wa\ Cos[qb])$

In[6]:= `T = 1/2 * (ma * la * ((qa)'[t])^2 +`
`        mb * (wb^2 * ((qa)'[t])^2 + lb^2 * ((qb)'[t])^2 + 2 * wa * lb * (qa)'[t] * (qb)'[t] * Cos[qa - qb]))`

Out[6]= $\dfrac{1}{2}\ (la\ ma\ qa'[t]^2 + mb\ (wb^2\ qa'[t]^2 + 2\ lb\ wa\ Cos[qa - qb]\ qa'[t]\ qb'[t] + lb^2\ qb'[t]^2))$

In[7]:= `dLdqap = ma * la^2 * x2 + mb * wa^2 * x2 + wa * lb * x5 * Cos[x1 - x4]`

Out[7]= $la^2\ ma\ x2 + mb\ wa^2\ x2 + lb\ wa\ x5\ Cos[x1 - x4]$

In[8]:= `dLdqbp = mb * lb^2 * x5 * Cos[x1 - x4]`

Out[8]= $lb^2\ mb\ x5\ Cos[x1 - x4]$

In[9]:= `dtdLdqa = x3 * (ma * la^2 + mb * wb^2) + wa * lb * x6 * Cos[x1 - x4] +`
`    wa * lb * x5^2 * Sin[x1 - x4] - wa * lb * x2 * x5 - wa * lb * x1 * x5 * Sin[x1 - x4]`

Out[9]= $(la^2\ ma + mb\ wb^2)\ x3 - lb\ wa\ x2\ x5 +$
$\quad lb\ wa\ x6\ Cos[x1 - x4] - lb\ wa\ x1\ x5\ Sin[x1 - x4] + lb\ wa\ x5^2\ Sin[x1 - x4]$

In[10]:= `dtdLdqb =`
`   mb * lb * x6 + wa * lb * x3 * Cos[x1 - x4] + wa * lb * x2 * x5 * Sin[x1 - x4] - wa * lb * x2^2 * Sin[x1 - x4]`

Out[10]= $lb\ mb\ x6 + lb\ wa\ x3\ Cos[x1 - x4] - lb\ wa\ x2^2\ Sin[x1 - x4] + lb\ wa\ x2\ x5\ Sin[x1 - x4]$

In[13]:= `eqns = {`
`dtdLdqa - dLdqap == 2 * T1 + 2 * w1 / l2 * T2 - k1 * x2,`
`dtdLdqb - dLdqbp == 2 * T2 - k2 * x5`
`}`

Out[13]= $\Big\{-la^2\ ma\ x2 - mb\ wa^2\ x2 + (la^2\ ma + mb\ wb^2)\ x3 - lb\ wa\ x2\ x5 - lb\ wa\ x5\ Cos[x1 - x4] +$

$\quad lb\ wa\ x6\ Cos[x1 - x4] - lb\ wa\ x1\ x5\ Sin[x1 - x4] + lb\ wa\ x5^2\ Sin[x1 - x4] == 2\ T1 + \dfrac{2\ T2\ w1}{l2} - k1\ x2,$

$\quad lb\ mb\ x6 + lb\ wa\ x3\ Cos[x1 - x4] - lb^2\ mb\ x5\ Cos[x1 - x4] -$

$\quad lb\ wa\ x2^2\ Sin[x1 - x4] + lb\ wa\ x2\ x5\ Sin[x1 - x4] == 2\ T2 - k2\ x5\Big\}$

In[14]:= `Solve[eqns, {x3, x6}]`

Out[14]= $\{\{$x3 $\to$

$-\Big(\Big(-$ lb wa Cos[x1 $-$ x4] $\big(-2$ T2 $+$ k2 x5 $-$ lb^2 mb x5 Cos[x1 $-$ x4] $-$ lb wa x2^2 Sin[x1 $-$ x4] $+$ lb wa x2 x5

Sin[x1 $-$ x4]$\big)$ $+$ lb mb $\Big(-2$ T1 $-$ $\dfrac{2\ \text{T2}\ \text{w1}}{\text{l2}}$ $+$ k1 x2 $-$ la^2 ma x2 $-$ mb wa^2 x2 $-$ lb wa x2 x5 $-$

lb wa x5 Cos[x1 $-$ x4] $-$ lb wa x1 x5 Sin[x1 $-$ x4] $+$ lb wa x5^2 Sin[x1 $-$ x4]$\Big)\Big)\Big/$

$\big($lb mb $\big($la^2 ma $+$ mb wb$^2\big)$ $-$ lb^2 wa^2 Cos[x1 $-$ x4]$^2\big)\Big)$, x6 $\to$

$-\big(\big(2$ l2 la^2 ma T2 $+$ 2 l2 mb T2 wb^2 $-$ k2 l2 la^2 ma x5 $-$ k2 l2 mb wb^2 x5 $-$ 2 l2 lb T1 wa Cos[x1 $-$ x4] $-$

2 lb T2 w1 wa Cos[x1 $-$ x4] $+$ k1 l2 lb wa x2 Cos[x1 $-$ x4] $-$ l2 la^2 lb ma wa x2 Cos[x1 $-$ x4] $-$

l2 lb mb wa^3 x2 Cos[x1 $-$ x4] $+$ l2 la^2 lb^2 ma mb x5 Cos[x1 $-$ x4] $+$

l2 lb^2 mb^2 wb^2 x5 Cos[x1 $-$ x4] $-$ l2 lb^2 wa^2 x2 x5 Cos[x1 $-$ x4] $-$ l2 lb^2 wa^2 x5 Cos[x1 $-$ x4]^2 $+$

l2 la^2 lb ma wa x2^2 Sin[x1 $-$ x4] $+$ l2 lb mb wa wb^2 x2^2 Sin[x1 $-$ x4] $-$

l2 la^2 lb ma wa x2 x5 Sin[x1 $-$ x4] $-$ l2 lb mb wa wb^2 x2 x5 Sin[x1 $-$ x4] $-$

l2 lb^2 wa^2 x1 x5 Cos[x1 $-$ x4] $\times$ Sin[x1 $-$ x4] $+$ l2 lb^2 wa^2 x5^2 Cos[x1 $-$ x4] $\times$ Sin[x1 $-$ x4]$\big)\Big/$

$\big($l2 lb $\big(-$ la^2 ma mb $-$ mb^2 wb^2 $+$ lb wa^2 Cos[x1 $-$ x4]$^2\big)\big)\big)\}\}$