```
ClearAll[f1, f2, f3, L1, L2, Ym, A1, A2, c1, c2, c3, x]
```

```
L1 = 2
L2 = 3
```

2

3

```
f1[x_] := Piecewise[{{1 - x / L1, x < L1}, {0, x > L1}}]
```

```
f2[x_] := Piecewise[{{x / L1, x < L1}, {1 - (x - L1) / L2, x > L1}}]
```

```
f3[x_] := Piecewise[{{0, x < L1}, {(x - L1) / L2, x > L1}}]
```

```
u[x_] := c1 f1[x] + c2 f2[x] + c3 f3[x]
```

```
u[x]
```

$$c1 \left(\begin{cases} 1 - \frac{x}{2} & x < 2 \\ 0 & \text{True} \end{cases} \right) + c3 \left(\begin{cases} 0 & x < 2 \\ \frac{1}{3} (-2 + x) & x > 2 \\ 0 & \text{True} \end{cases} \right) + c2 \left(\begin{cases} \frac{x}{2} & x < 2 \\ 1 + \frac{2-x}{3} & x > 2 \\ 0 & \text{True} \end{cases} \right)$$

```
u[0] // Evaluate
```

c1

```
Pote = Ym A1 / 2 Integrate[u'[x]^2, {x, 0, L1}, Assumptions → L1 > 0] +
    Ym A2 / 2 Integrate[u'[x]^2, {x, L1, L1 + L2}, Assumptions → {L1 > 0, L2 > 0}] -
    Q u[0] - F u[L1 + L2] // Simplify
```

$$-c3\,F - c1\,Q + \frac{1}{4} A1\,(c1 - c2)^2\,Ym + \frac{1}{6} A2\,(c2 - c3)^2\,Ym$$

```
D1 = D[Pote, c1];
D2 = D[Pote, c2];
D3 = D[Pote, c3];
```

```
Res = Assuming[L1 > 0 && L2 > 0, Solve[{D2 == 0, D3 == 0}, {c2, c3}]] // Simplify
```

$$\left\{ \left\{ c2 \to c1 + \frac{2\,F}{A1\,Ym},\ c3 \to c1 + \frac{(3\,A1 + 2\,A2)\,F}{A1\,A2\,Ym} \right\} \right\}$$

```
c2 = Res[[1]][[1]][[2]]
c3 = Res[[1]][[2]][[2]]
```

$$c1 + \frac{2\,F}{A1\,Ym}$$

$$c1 + \frac{(3\,A1 + 2\,A2)\,F}{A1\,A2\,Ym}$$

```
Solve[D1 == 0, Q] // Simplify
```

$$\{\{Q \to -F\}\}$$

```
Solve[u[0] == 0, c1] // Simplify
```

$$\{\{c1 \to 0\}\}$$

```
c1 = %[[1]][[1]][[2]]
```

0

u[x]

$$\frac{(3\,A1+2\,A2)\,F\left(\begin{cases}0 & x<2\\ \frac{1}{3}\,(-2+x) & x>2\\ 0 & \text{True}\end{cases}\right)}{A1\,A2\,Ym}+\frac{2\,F\left(\begin{cases}\frac{x}{2} & x<2\\ 1+\frac{2-x}{3} & x>2\\ 0 & \text{True}\end{cases}\right)}{A1\,Ym}$$

Pote // Simplify

$$-\frac{(3\,A1+2\,A2)\,F^2}{2\,A1\,A2\,Ym}$$

c1

c2

c3

0

$$\frac{2\,F}{A1\,Ym}$$

$$\frac{(3\,A1+2\,A2)\,F}{A1\,A2\,Ym}$$