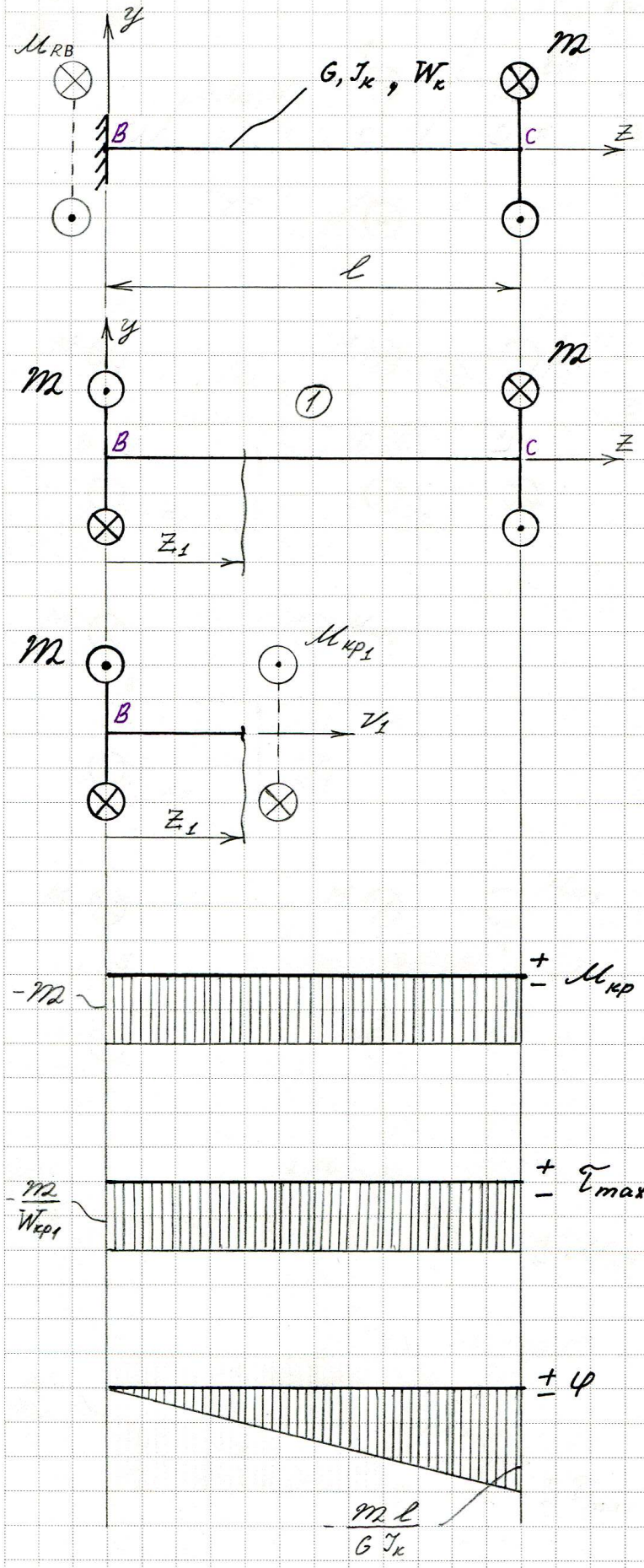

Дано: $\ell, m, G, J_к, W_к$

Найти: $M_{кр}, \tau_{max}, \varphi,$ A и U.

$$\sum M_z = 0 = -M_{RB} - m$$

$$M_{RB} = -m$$

$$\sum M_{z_1} = 0 = m + M_{кр_1}$$

$$M_{кр_1} = -m$$

$$\tau_{max_1} = \frac{M_{кр1}}{W_{к1}} = -\frac{m}{W_{к1}}$$

$$\varphi_1 = \varphi_0^{кон} + \int_0^{z_1} \frac{M_{кр1}\, dz_1}{G_1 J_{к1}} =$$

$$= -\int_0^{z_1} \frac{m \cdot dz_1}{G J_к} = -\frac{m \cdot z_1}{G \cdot J_к}$$

$z_1 = 0: \varphi_1^{нач.} = 0$

$z_1 = \ell: \varphi_1^{кон} = -\frac{m \cdot \ell}{G \cdot J_к}$

Работа внешних моментов:

$$A = \sum_j \frac{1}{2} M_j \varphi_j = \frac{1}{2} M_B \cdot \varphi_B + \frac{1}{2} M_C \cdot \varphi_C =$$

$$= \frac{1}{2} m \cdot 0 + \frac{1}{2}(-m) \cdot \left(-\frac{m\ell}{G J_к}\right) = \frac{m^2 \ell}{2 G J_к}$$

Потенциальная энергия деформации:

$$U = \sum_i \frac{M_{кр\,i}^2 \cdot l_i}{2 G_i J_{к\,i}} = \frac{M_{кр1}^2 \cdot l_1}{2 G_1 J_{к1}} = \frac{(-m)^2 \cdot \ell}{2 G J_к} = \frac{m^2 \ell}{2 G J_к}$$

$\boxed{A = U}$