

建筑力学期末测试试卷 1 答案

一、单选题：1 C 2 A 3 A 4 A

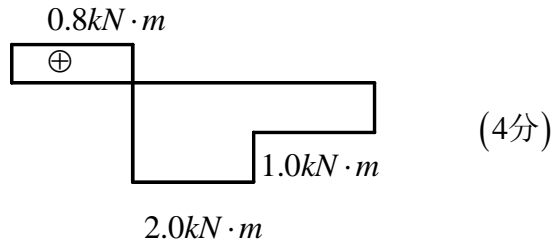
二、判断题：1 × 2 × 3 √ 4 √ 5 × 6 × 7 √ 8 × 9 ×

三、作图题：

1. $F_{S, \max}^+ = 8\text{kN}$, $F_{S, \max}^- = 12\text{kN}$, $M_{\max}^+ = 8\text{kN} \cdot \text{m}$

四、计算题：

1. 解：(1) 扭矩图



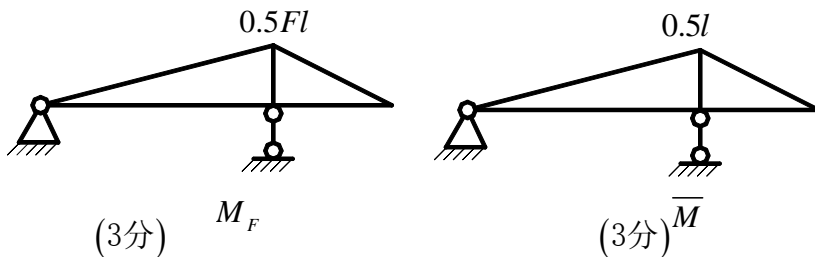
(2) $T_{\max} = 2.8\text{kN} \cdot \text{m}$ ，该轴的最大切应力应发生在 B 截面， $\tau = \frac{T}{I_p} \cdot \rho$

$$I_p = \frac{\pi d^4}{32} = \frac{\pi \times 0.1^4}{32}, \quad \tau_{\max} = \frac{T_{\max}}{I_p} \cdot \rho = \frac{2.8 \times 32}{\pi \times 0.1^4} \times 0.05 = 14.27\text{Mpa} \quad (4\text{分})$$

$$(3) \text{ AD 截面的相对扭转角 } \varphi_{AD} = \frac{Tl}{GI_p} = \frac{(0.8 - 2.0 - 1.0) \times 10^3 \times 32}{80 \times 10^6 \times \pi \times 0.1^4} \times 1 = -2.8\text{rad} \quad (4\text{分})$$

2. 解：用单位荷载法计算外伸梁的位移

$$\Delta_c = \frac{1}{EI} \left(\frac{1}{2} \times l \times 0.5Fl \times \frac{2}{3} \times 0.5l + \frac{1}{2} \times 0.5l \times 0.5Fl \times \frac{2}{3} \times 0.5l \right) = \frac{Fl^3}{8EI} \quad (6\text{分})$$



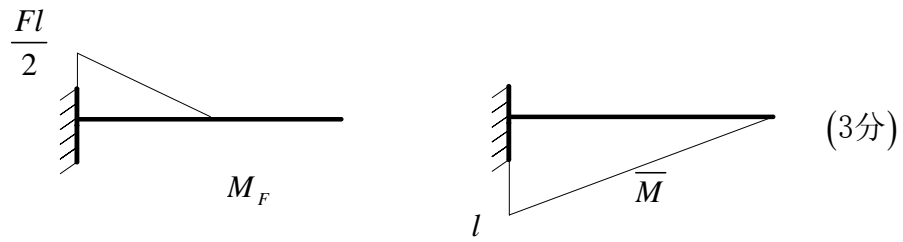
3. 解：画出悬臂梁的弯矩图（图略） (5分)

$$M_{\max} = \frac{1}{2} \times 10 \times 4^2 = 80\text{kN} \cdot \text{M}, \quad \sigma_{\max} = \frac{M_{\max}}{I} y \quad (5\text{分})$$

$$I = \frac{bh^3}{12} = \frac{0.3 \times 0.45^3}{12}, \quad \sigma_{\max} = \frac{M_{\max}}{I} y = \frac{80 \times 12}{0.3 \times 0.45^3} \times \frac{0.45}{2} = 7.9\text{Mpa} < 10\text{Mpa}$$

∴ 满足强度要求 (5分)

4. 解:



如图所示基本结构的弯矩图

$$\delta_{11} = \frac{1}{2EI} \left(\frac{1}{2} \times \frac{1}{2} l \times \frac{1}{2} l \times \frac{l}{2} \times \frac{2}{3} \right) + \frac{1}{EI} \left(\frac{1}{2} \times \frac{1}{2} l \times \frac{1}{2} l \times \frac{5}{6} l + \frac{1}{2} l \times \frac{1}{2} l \times \frac{3}{4} l \right) = \frac{5l^3}{16EI} \quad (5分)$$

$$\Delta_{1F} = -\frac{1}{EI} \left(\frac{1}{2} \times \frac{Fl}{2} \times \frac{l}{2} \right) \times \frac{5}{6} l = -\frac{5Fl^3}{48EI} \quad \text{代入方程 } \delta_{11} \cdot X_1 + \Delta_{1F} = 0 \quad \text{得 } X_1 = \frac{1}{3} F \quad (4分)$$

