

公表用解答例

受験番号

氏名

総 得 点

問題1 (40点)

得
点

(1)

$$\text{水平分力: } 20F [\text{N}] \times 3/5 = 12F [\text{N}]$$

$$\text{鉛直分力: } 20F [\text{N}] \times 4/5 = 16F [\text{N}]$$

H : 水平力, V : 鉛直力とする。

$$\sum H = 0: H_A + 12F = 0 \quad \therefore H_A = -12F [\text{N}]$$

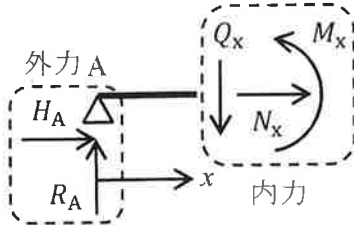
$$\sum V = 0: R_A - 16F + 11F + R_B = 0 \quad \therefore R_A + R_B = 5F \quad \cdots \textcircled{1}$$

$$\sum M_{(A)} = 0: 16F \times L - 11F \times 2L - R_B \times 3L = 0 \quad \therefore R_B = -2F [\text{N}]$$

$$\textcircled{1} \text{より } R_A = 7F [\text{N}]$$

(2)

[区間 AC]



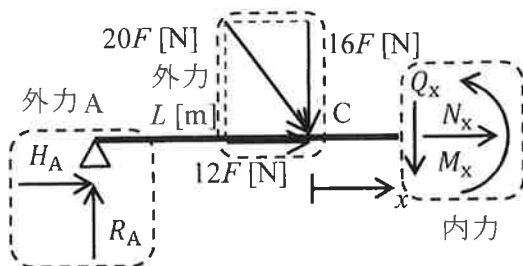
$$\sum H = 0: H_A + N_x = 0$$

$$\therefore N_x = -H_A = 12F [\text{N}]$$

$$\sum M_{(x)} = 0: R_A \times x - M_x = 0$$

$$\therefore M_x = R_A x = 7Fx [\text{N} \cdot \text{m}]$$

[区間 CD]



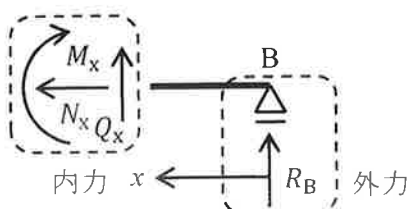
$$\sum H = 0: H_A + 12F + N_x = 0$$

$$\therefore N_x = -H_A - 12F = 0$$

$$\sum M_{(x)} = 0: R_A \times (L + x) - 16F \times x - M_x = 0$$

$$\therefore M_x = (R_A - 16F)x + R_A L = -9Fx + 7FL [\text{N} \cdot \text{m}]$$

[区間 DB]



$$\sum H = 0: -N_x = 0$$

$$\therefore N_x = 0$$

$$\sum M_{(x)} = 0: M_x - R_B \times x = 0$$

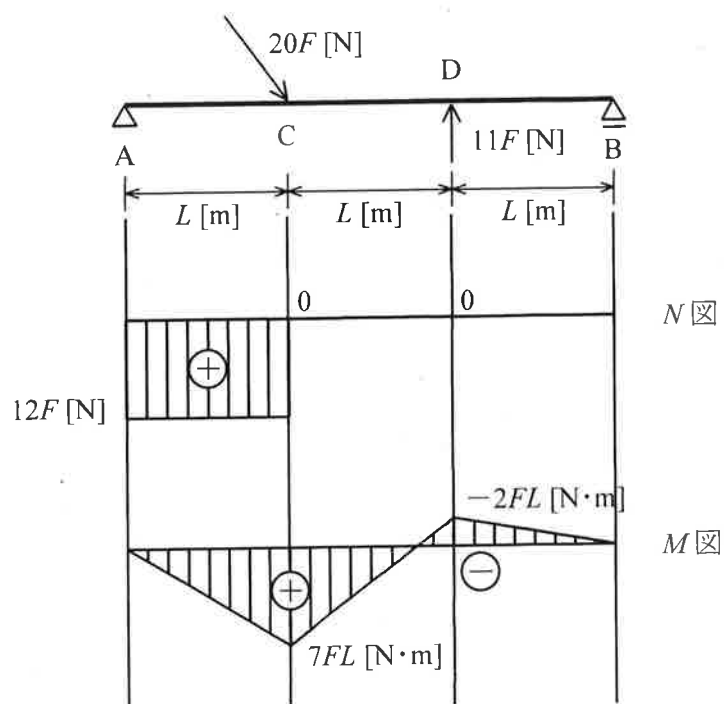
$$\therefore M_x = R_B x = -2Fx [\text{N} \cdot \text{m}]$$

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(3)



断面力図（ N 図， M 図）

(4)

$$U_N = \int_0^L \frac{(N_x)^2}{2EA} dx = \int_0^L \frac{(12F)^2}{2EA} dx = \frac{72F^2}{EA} [x]_0^L = \frac{72F^2 L}{EA} [J]$$

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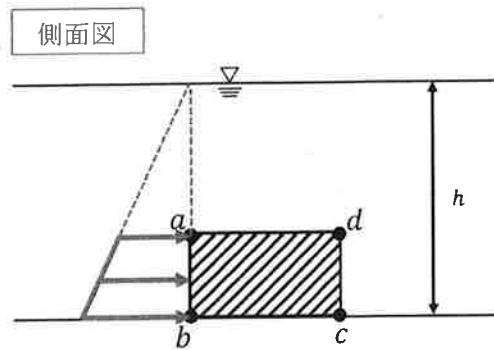
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問題2（30点）

得点

(1)



(2)

$$p_a = \rho g(h - \gamma)$$

$$p_b = \rho g h$$

(3)

$$h_G = \frac{1}{2}\gamma + (h - \gamma)$$

(4)

$$\begin{aligned} P &= \rho g h_G A \\ &= \rho g h_G \alpha \gamma \end{aligned}$$

(5)

$$\begin{aligned} h_C &= h_G + \frac{I_G}{h_G A} \\ &= h_G + \frac{\frac{\alpha \gamma^3}{12}}{h_G \alpha \gamma} \\ &= h_G + \frac{\gamma^2}{12 h_G} \end{aligned}$$

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問題3（30点）

得点

(1)

$$1) \rho_t = \frac{\rho_s + e \cdot \frac{S_r}{100} \rho_w}{1 + e} \quad \left(= \frac{\frac{\rho_s}{\rho_w} + e \cdot \frac{S_r}{100}}{1 + e} \rho_w \text{でも可} \right)$$

$$2) \rho_d = \frac{\rho_t}{1 + \frac{w}{100}}$$

$$3) e = \frac{\rho_s}{\rho_d} - 1$$

$$4) S_r = \frac{w \rho_s}{e \rho_w}$$

(2)

$$1) \rho_t = \frac{116 \times 10^{-6}}{1.0 \times 10^5 \times 10^{-9}} = 1.16 \text{ Mg/m}^3$$

$$2) w = \frac{116 - 100}{100} \times 100 = 16.0 \%$$

$$3) \rho_d = \frac{1.16}{1 + \frac{16.0}{100}} = 1.00 \text{ Mg/m}^3$$

(別解)

$$\rho_d = \frac{116 - 100}{116} = 1.00 \text{ Mg/m}^3$$

$$4) e = \frac{2.60}{1.00} - 1 = 1.60$$

$$5) S_r = \frac{16 \times 2.60}{1.6 \times 1.00} = 26.0 \%$$

$$6) \gamma_t = 1.16 \times 10 = 11.6 \text{ kN/m}^3$$