

國立清華大學 命題紙

98 學年度工程與系統科學系乙組碩士班入學考試

科目 工程力學(含靜力學、材料力學) 科目代碼 2705 共 3 頁第 1 頁 *請在【答案卷卡】內作答

1. A circular sea wall is made of concrete. ($>0\%$)

(1) Determine the total weight of the wall if the concrete has a specific weight of $\gamma_c = 24 \frac{\text{kN}}{\text{m}^3}$

(2) Determine the magnitude of the resultant hydrostatic force acting on this sea wall

Given:

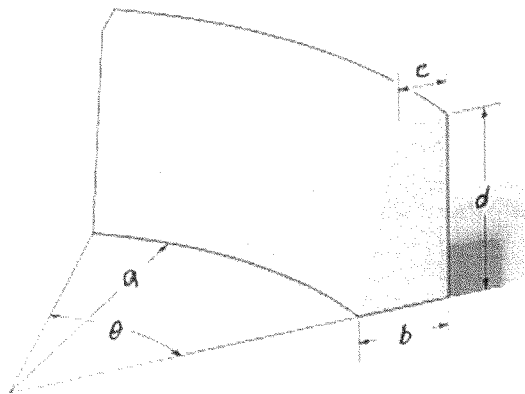
$a = 20 \text{ m}$

$b = 5 \text{ m}$

$c = 2.5 \text{ m}$

$d = 10 \text{ m}$

$\theta = 50 \text{ deg}$



2. The double-collar bearing is subjected to an axial force P . Assuming that collar A supports kP and collar B supports $(1-k)P$, both with a uniform distribution of pressure, determine the maximum frictional moment M that may be resisted by the bearing. ($>0\%$)

Given:

$P = 4 \text{ kN}$

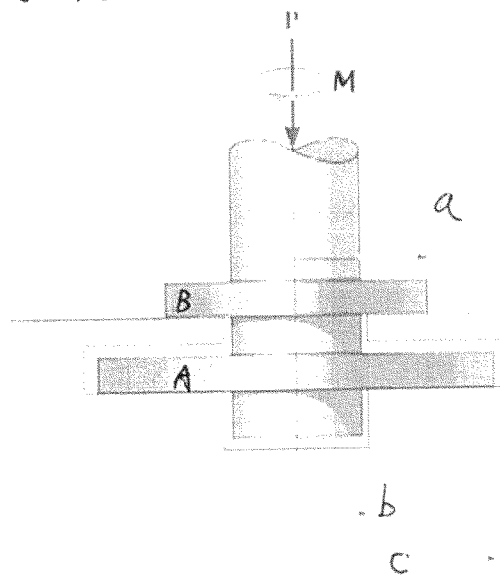
$a = 20 \text{ mm}$

$b = 10 \text{ mm}$

$c = 30 \text{ mm}$

$\mu_s = 0.2$

$k = 0.75$



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科目工程力學(含靜力學、材料力學) 科目代碼 2705 共 3 頁第 2 頁 *請在【答案卷卡】內作答

3. The cable is subjected to the parabolic loading $w = w_0 \left(1 - \left[\frac{2x}{a} \right]^2 \right)$. Determine the equation $y = f(x)$ which defines the cable shape AB and the maximum tension in the cable. (> 0)

Units used:

$$\text{kN} = 10^3 \text{ N}$$

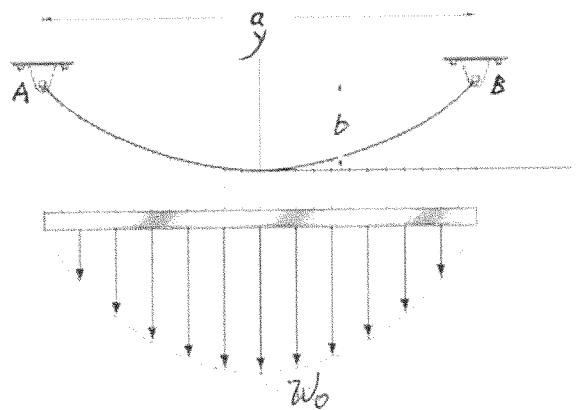
Given:

$$w = w_0 \left[1 - \left(\frac{2x}{a} \right)^2 \right]$$

$$a = 30 \text{ m}$$

$$w_0 = 2.5 \frac{\text{kN}}{\text{m}}$$

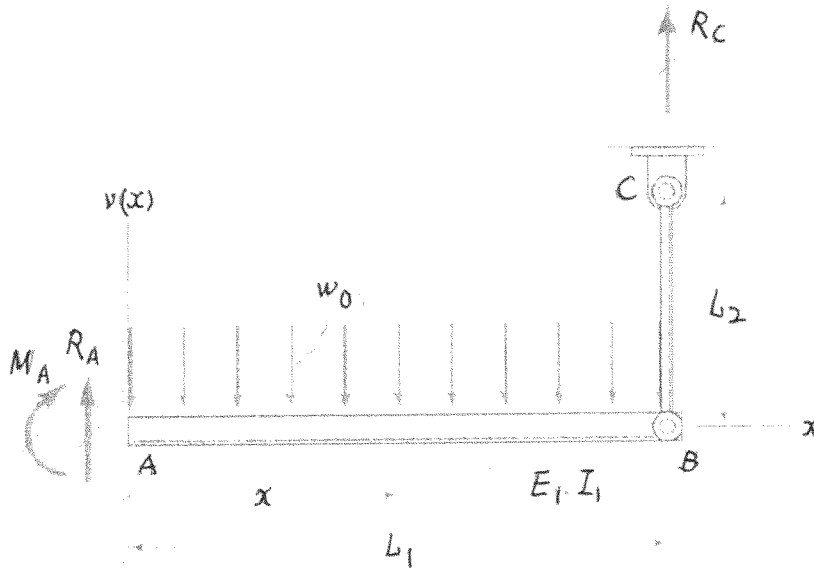
$$b = 6 \text{ m}$$



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4. At end B , the cantilever beam is pinned to a uniform rod whose cross-section area is A_2 , whose length is L_2 , and whose modulus of elasticity is E_2 . The beam supports a uniformly distributed load of intensity w_0 ; its flexural rigidity is $E_1 I_1$, and its length is L_1 . (a) Use the second-order integration method to determine the reactions R_A and M_A at A , and the tension, F_2 , in the rod. (b) Determine an expression for the deflection curve, $v(x)$, of the beam. ($>0 \uparrow$)



5. The state of plane stress at a point can be described by a known tensile stress $\sigma_x = 70$ MPa, an unknown tensile stress σ , and an unknown shear stress τ , as indicated in the figure. At this point the maximum in-plane shear stress is 78 MPa, and one of the two in-plane principal stresses is 22 MPa(T). Determine the values of the two unknown stresses, labeled σ and τ on the figure, and determine the second in-plane principal stress. The stresses act in the directions shown, that is, $\sigma_y = \sigma$ and $\tau_{xy} = -\tau$. ($>0 \uparrow$)

