

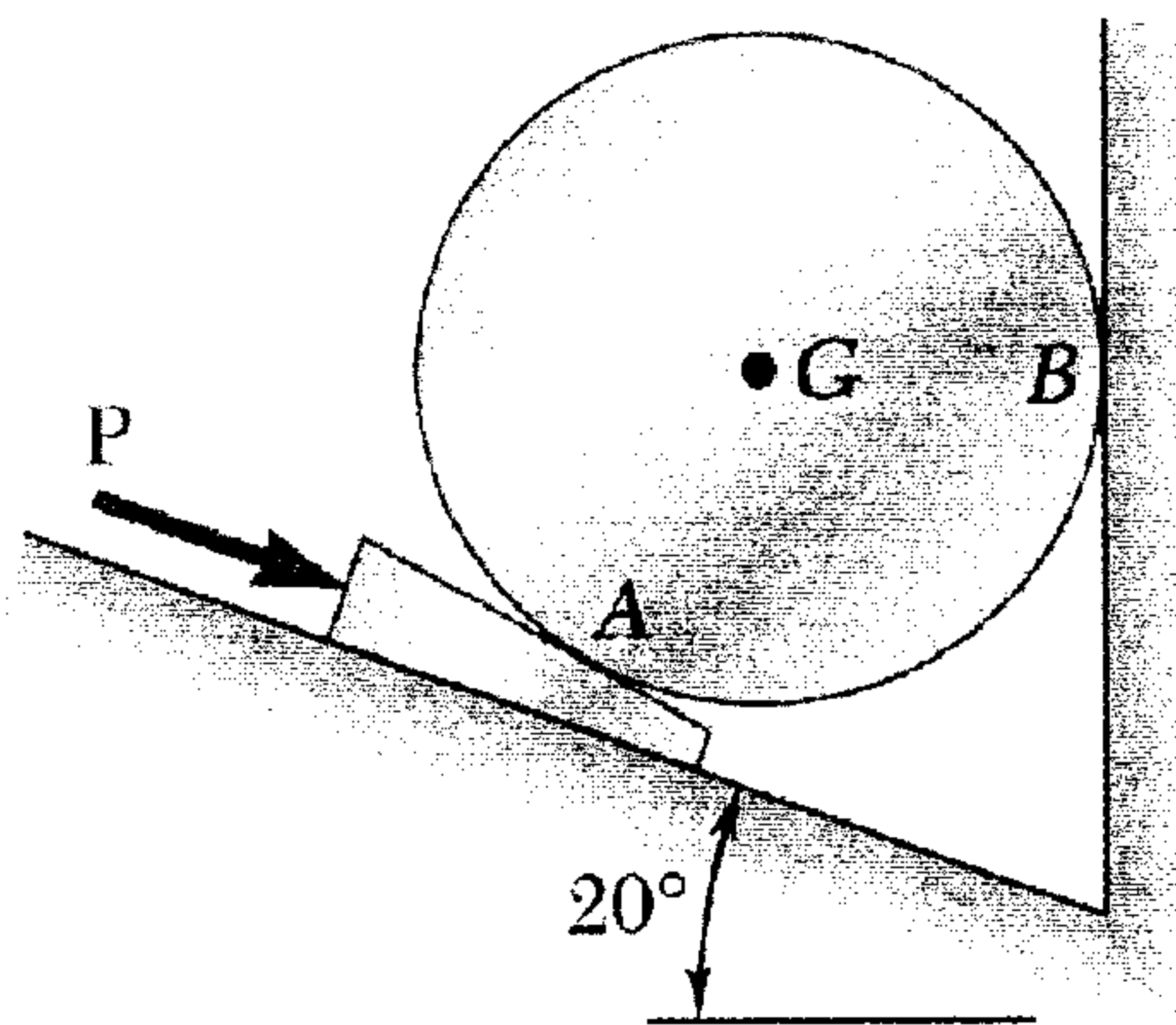
國立清華大學 101 學年度碩士班考試入學試題

系所班組別：動力機械工程學系丙組（固體與奈微米力學組）

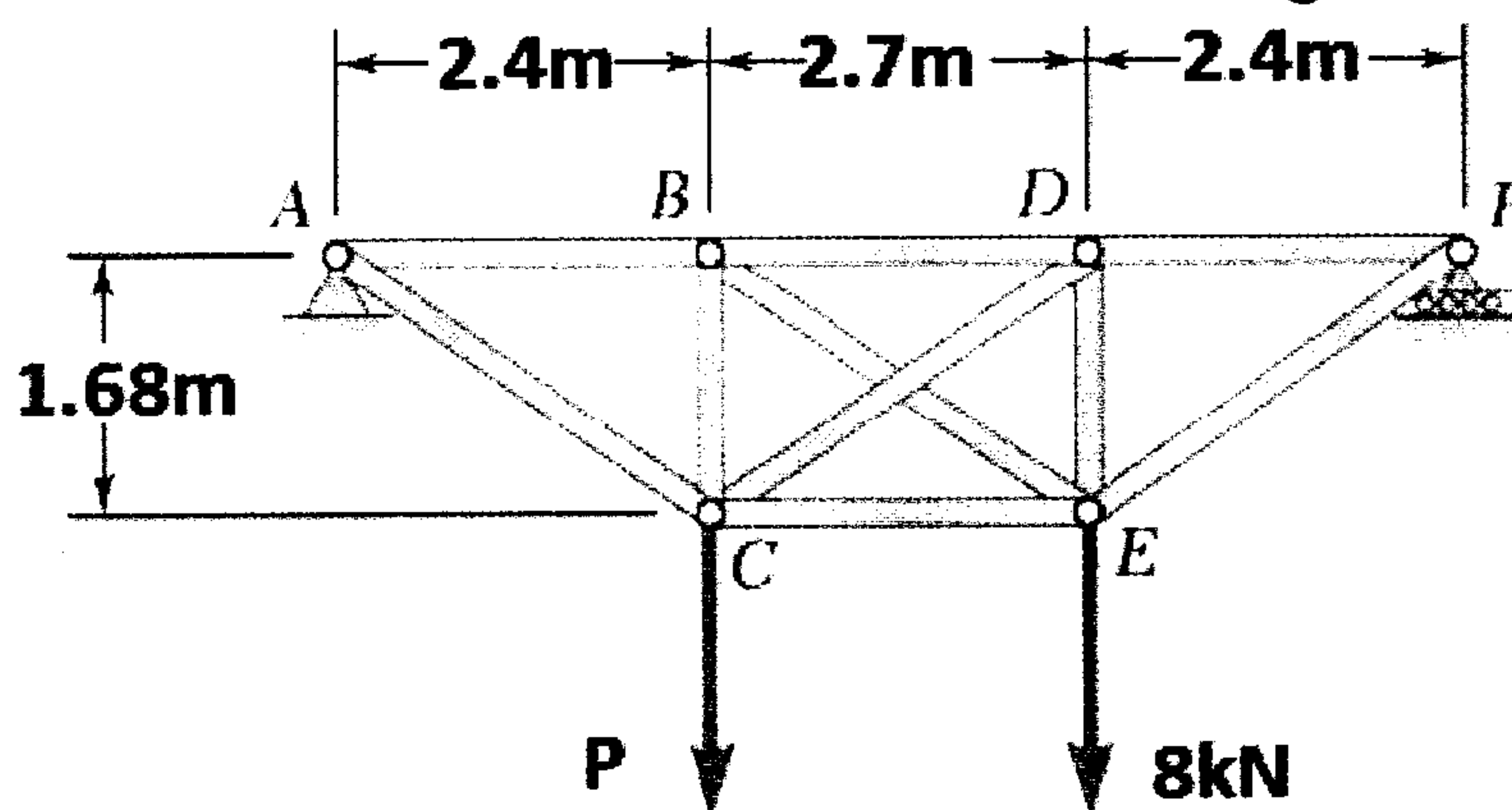
考試科目（代碼）：工程力學（含靜力學、動力學、材料力學）1301

共 4 頁，第 1 頁 *請在【答案卷、卡】作答

1. A 10° wedge is forced under an 80-kg cylinder as shown. Knowing that the coefficient of static friction at all surfaces is 0.25, determine the force P for which motion of the wedge is impending. (15%)



2. The diagonal members in the center panel of the truss shown are very slender and can act only in tension; such members are known as *counters*. Determine the force in members BD and CE and in the counter which is acting when $P = 6$ kN. (15%)



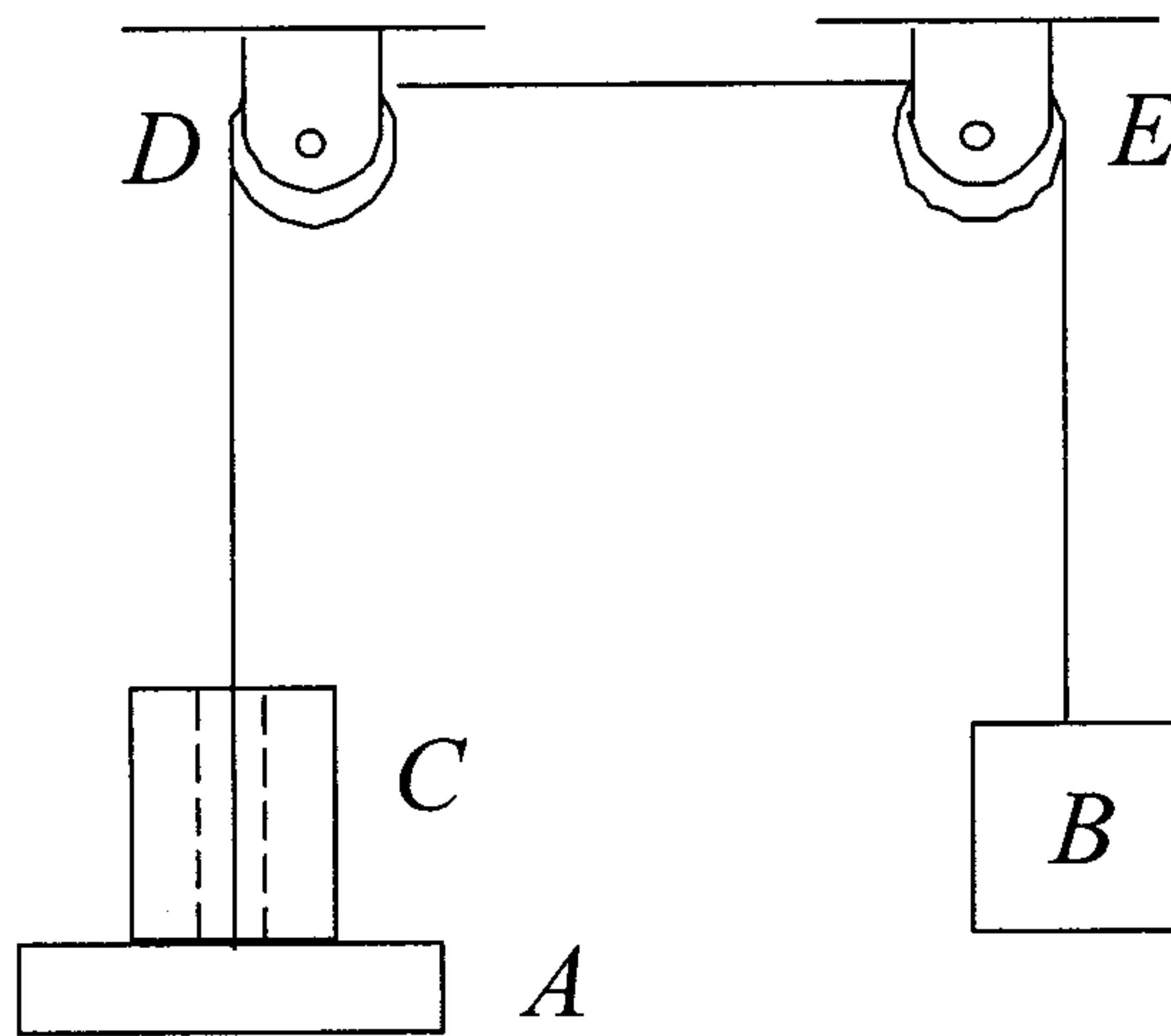
國立清華大學 101 學年度碩士班考試入學試題

系所班組別：動力機械工程學系丙組（固體與奈微米力學組）

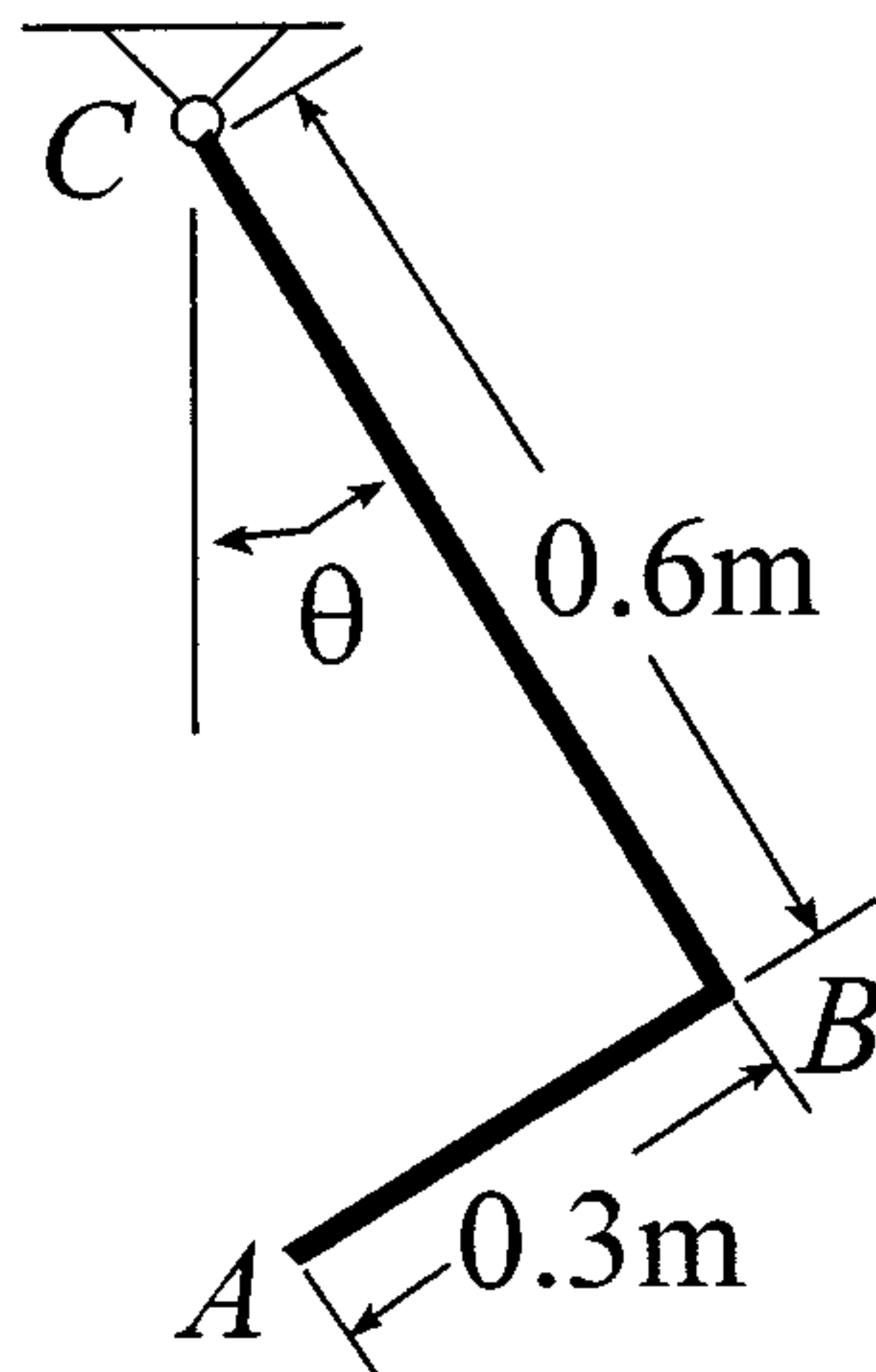
考試科目（代碼）：工程力學（含靜力學、動力學、材料力學）1301

共 4 頁，第 2 頁 *請在【答案卷、卡】作答

3. A 12-kg cylinder C rests on a 6-kg platform A supported by a cord which passes over the pulleys D and E and is attached to a 6-kg block B . Knowing that the system is released from rest, determine (a) the velocity of block B after 1 s, (b) the force exerted by the cylinder on the platform. (15%)



4. The object ABC consists of two slender rods welded perpendicularly at point B . Rod AB has a mass of 2 kg and rod BC has a mass of 4 kg. Knowing the magnitude of the angular velocity of ABC is 10 rad/s when $\theta = 0^\circ$, determine the components of reactions at hinge C when $\theta = 0^\circ$. (15%)



國立清華大學 101 學年度碩士班考試入學試題

系所班組別：動力機械工程學系丙組（固體與奈微米力學組）

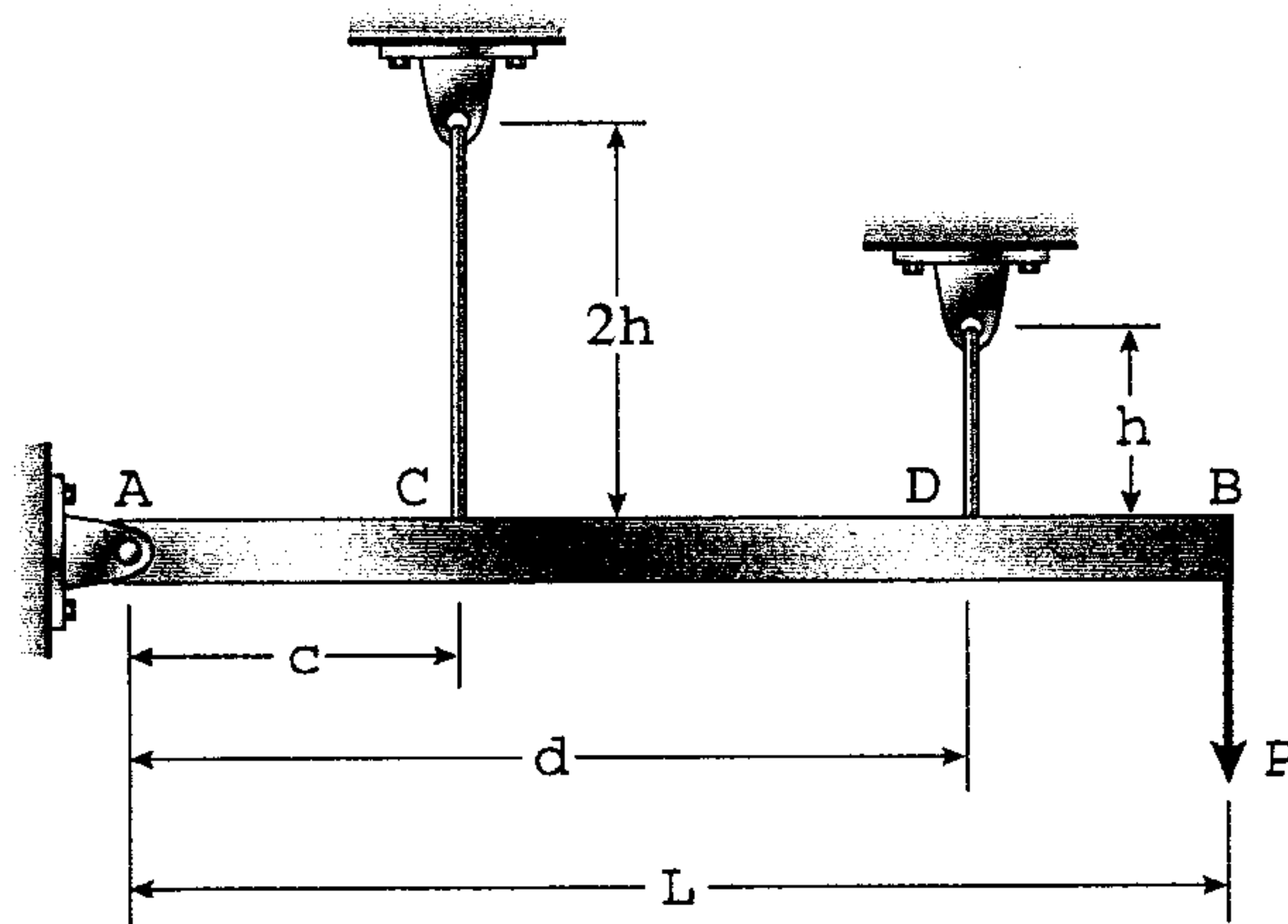
考試科目（代碼）：工程力學（含靜力學、動力學、材料力學）1301

共 4 頁，第 3 頁 *請在【答案卷、卡】作答

5. A rigid bar AB of length $L=1.6$ m is hinged to a support at A and supported by two vertical wires attached at points C and D (see figure). Both wires have the same cross-sectional area ($A=16$ mm²) and are made of the same material (modulus $E=200$ GPa). The wire at D has length $h=0.4$ m and the wire at C has length twice that amount. The horizontal distances are $c=0.5$ m and $d=1.2$ m. (15%)

(a) Determine the tensile stresses σ_C and σ_D in the wires due to the load $P=1000$ N acting at end B of the bar.

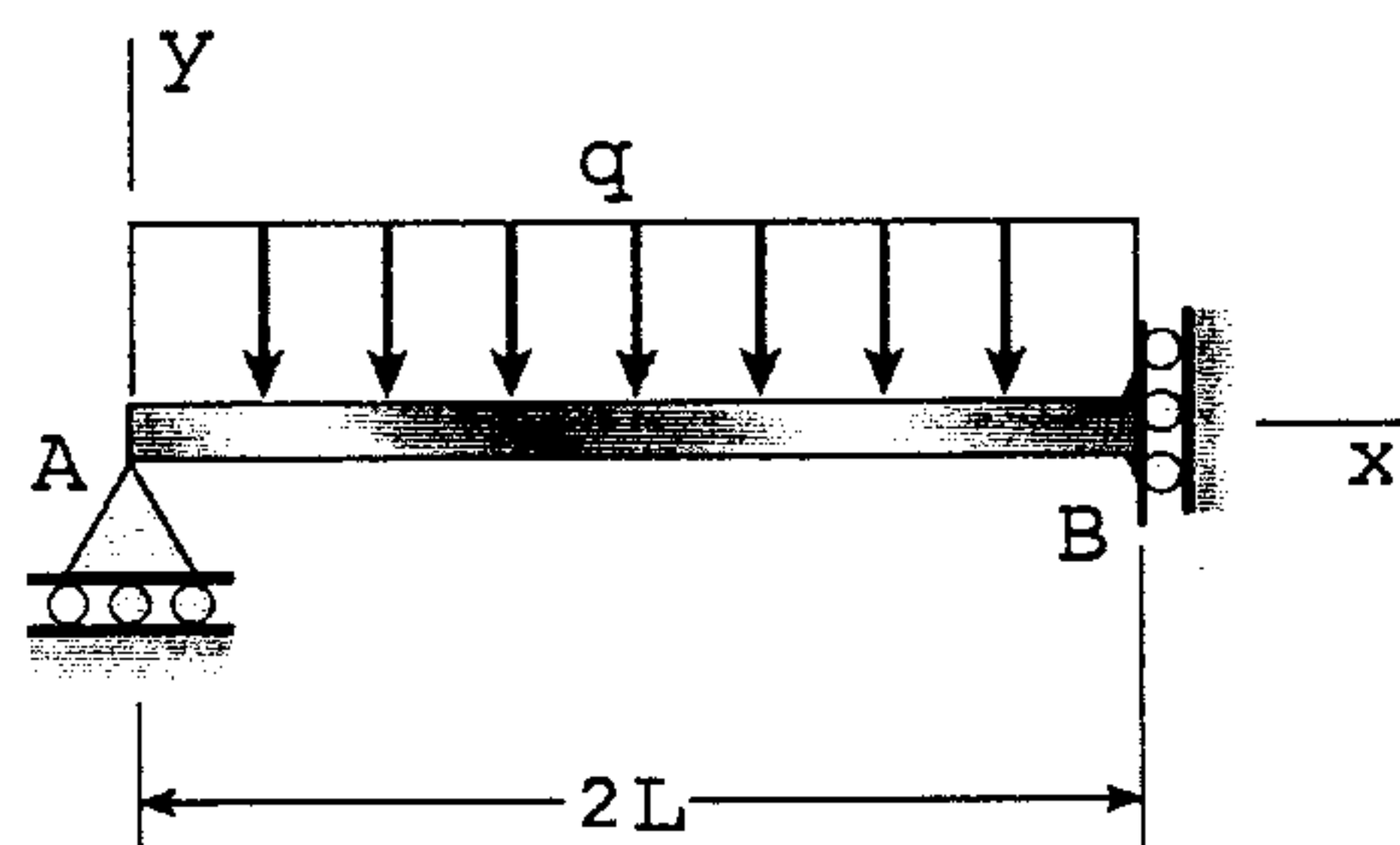
(b) Find the downward displacement δ_B at end B of the bar.



6. The beam, of length of $2L$, has a roller support at A and a guided support at B , as shown in the figure. The guided support permits vertical movement but no rotation. (15%)

(1) Derive the equation of deflection curve for the beam AB due to the uniform load of intensity q .

(2) Find the maximum deflection δ_{\max} of the beam AB .



國立清華大學 101 學年度碩士班考試入學試題

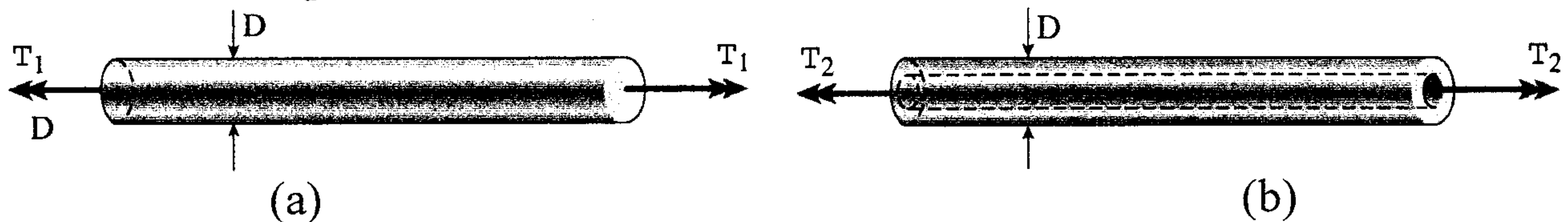
系所班組別：動力機械工程學系丙組（固體與奈微米力學組）

考試科目（代碼）：工程力學（含靜力學、動力學、材料力學）1301

共 4 頁，第 4 頁 *請在【答案卷、卡】作答

7. (選擇題 Total 10%, 2.5% each.) Choose the correct answers for the following 4 questions.

Problems 7-(1) and 7-(2). A solid aluminum bar of diameter D is subjected to a torque T_1 , as shown in part (a) of the figure. The allowable shear stress in the aluminum bar is τ_a .



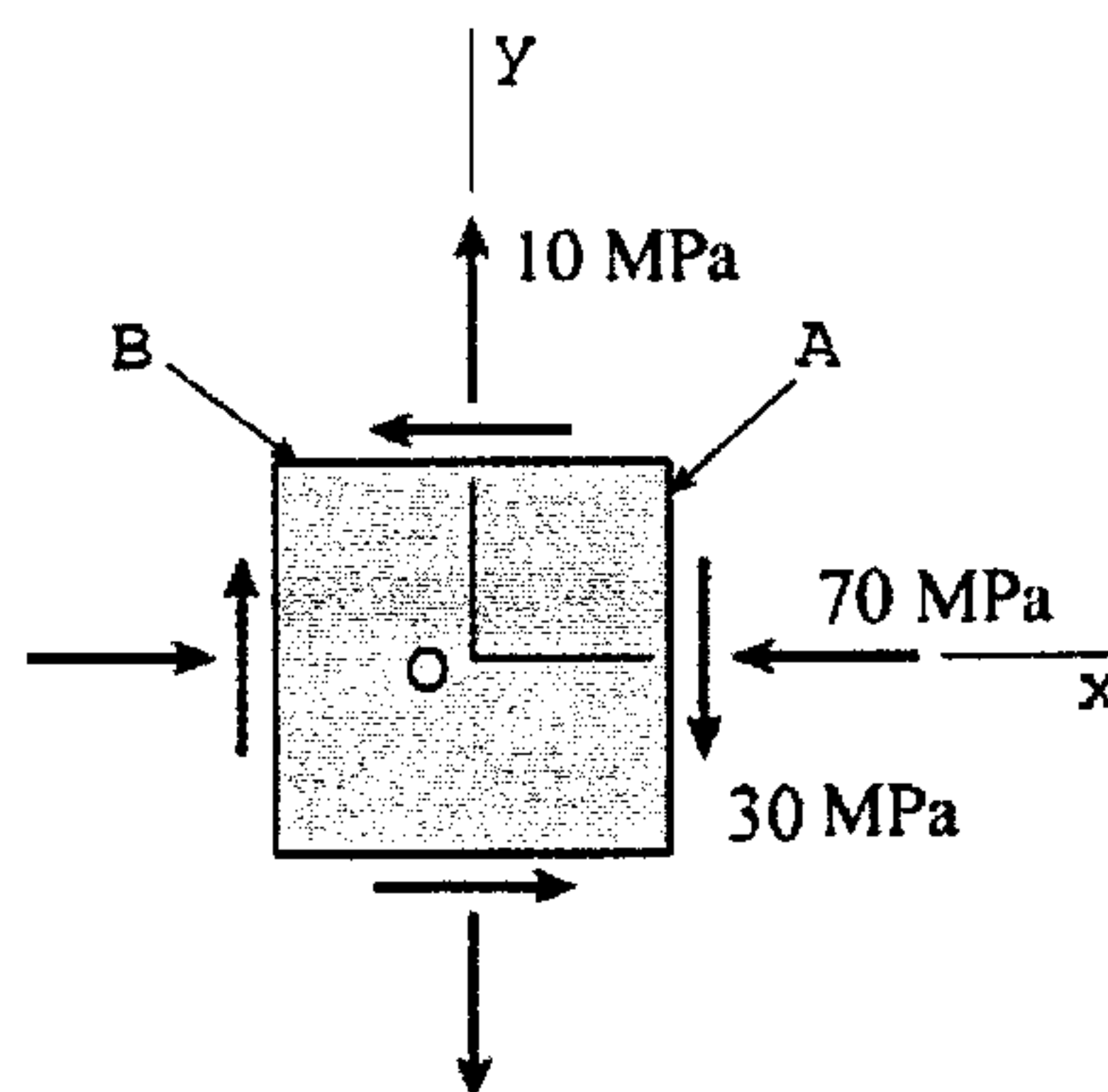
7-(1) The maximum permissible value of the torque T_1 is

- (A) $\pi D^3 \tau_a / 8$ (B) $\pi D^3 \tau_a / 16$ (C) $\pi D^3 \tau_a / 32$ (D) $\pi D^4 \tau_a / 16$ (E) $\pi D^4 \tau_a / 32$

7-(2) If a hole of diameter d is drilled longitudinally through the bar, as shown in part (b) of the figure, what is the maximum permissible value of the torque T_2 ?

- (A) $\pi(D^3 - d^3)\tau_a / 8d$ (B) $\pi(D^3 - d^3)\tau_a / 16d$ (C) $\pi(D^3 - d^3)\tau_a / 16D$ (D) $\pi(D^4 - d^4)\tau_a / 16D$ (E) $\pi(D^4 - d^4)\tau_a / 32D$

Problems 7-(3) and 7-(4). The stresses acting on element A in the web of a wide-flange beam is shown below.



7-(3) The maximum principal stress is

- (A) 50 MPa (B) 40 MPa (C) 30 MPa (D) 20 MPa (E) 10 MPa

7-(4) The maximum shear stress is

- (A) 50 MPa (B) 40 MPa (C) 30 MPa (D) 20 MPa (E) 10 MPa