

# 淡江大學八十八學年度碩士班招生考試試題

系別：土木工程學系

科目：工程力學(靜力學、材料力學、動力學)

本試題共 / 頁

1. (a) The cross section of a composite beam is shown in Fig. 1a. The Young's moduli of the two materials ① and ② are  $E_a$  and  $E_b$ , respectively. If a bending moment  $M$  is acting on the section, find the location of the neutral axis and the stress distribution on each material. (20%)
- (b) A composite beam is constructed of wood ( $6\text{ cm} \times 8\text{ cm}$ ) reinforced on the lower side by steel ( $0.5\text{ cm} \times 6\text{ cm}$ ), as shown in Fig. 1b. The Young's modulus for the wood is  $E_w = 8.4 \times 10^4\text{ kgf/cm}^2$  and for the steel is  $E_s = 2.1 \times 10^6\text{ kgf/cm}^2$ . Find the allowable bending moment  $M_{\text{allow}}$  for the beam if the allowable stress in the wood is  $\sigma_w = 100\text{ kgf/cm}^2$  and in the steel is  $\sigma_s = 1000\text{ kgf/cm}^2$ . (15%)

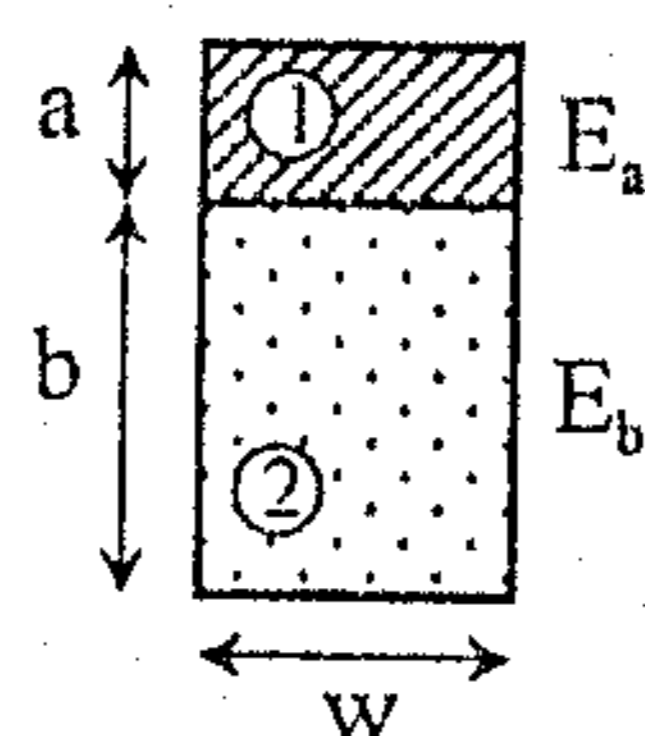


Fig. 1a

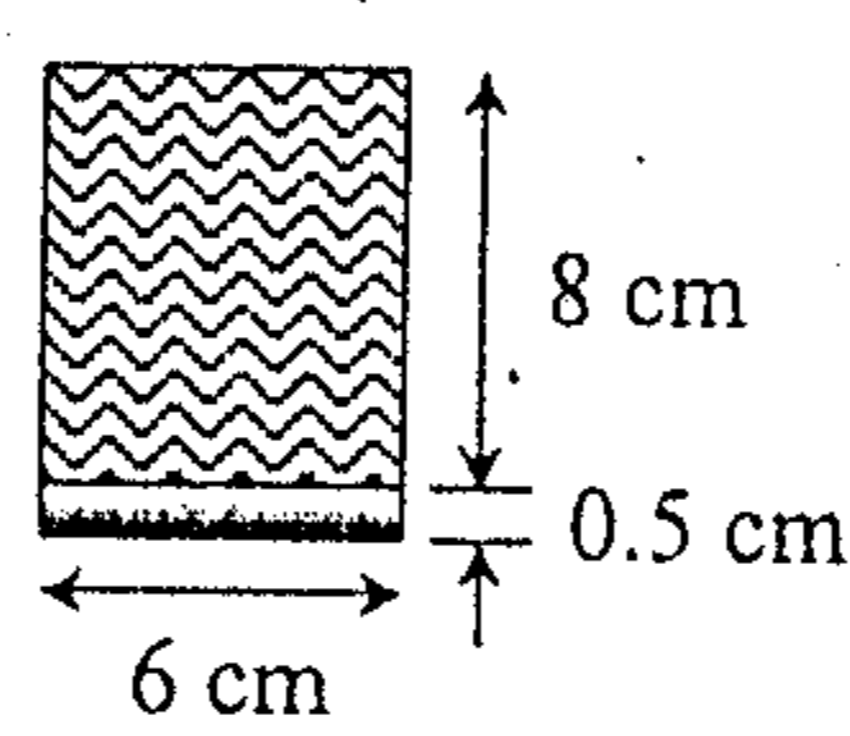


Fig. 1b

2. A cantilever beam with constant  $EI$  is subject to an uniform load  $P_1$  and a concentrated force  $P_2$ , as shown in Fig. 2. (a) Use moment-area method to find the shear force and moment at the fixed end. (15%) (b) Determine the rotational angle at the roller support. (15%)

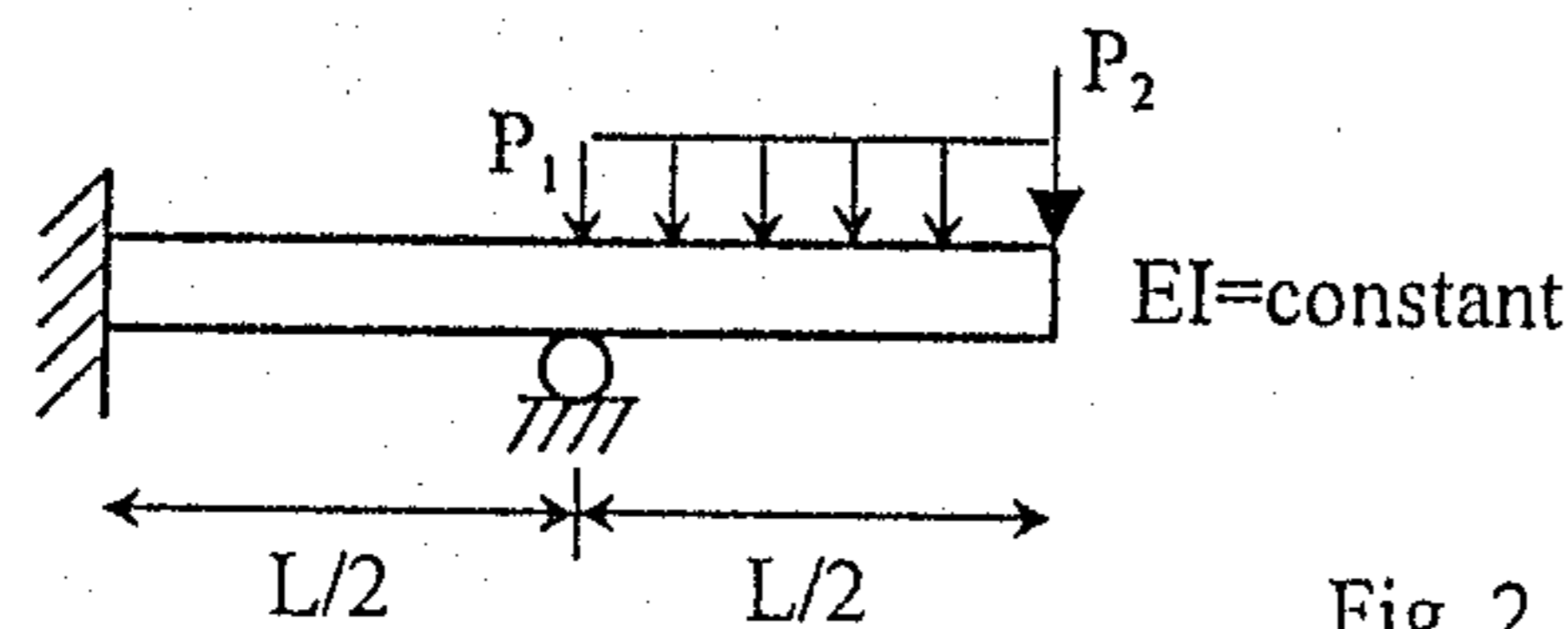


Fig. 2

3. In a two-member system as shown in Fig. 3, point A is a hinge and point D can only move horizontally. Member AB rotates in a constant clockwise angular velocity of  $2000\text{ r/min}$ . For the position indicated, determine (a) the angular velocity of the member BD and the velocity of the point D. (15%) (b) the angular acceleration of the member BD and the acceleration of point D. (20%)

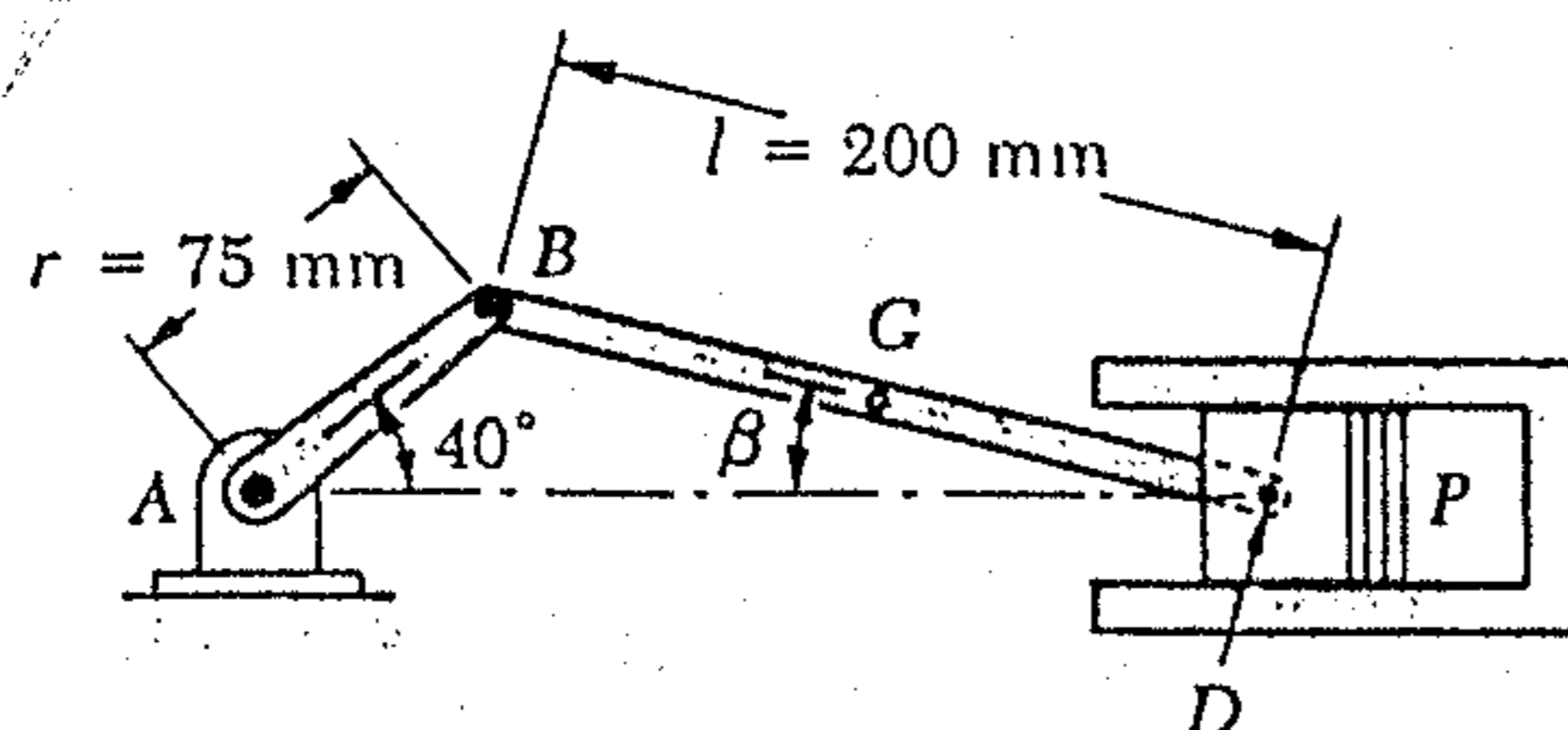


Fig. 3