

大葉大學 九十二 學年度 研究所碩士班 招生考試試題紙

系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註
機械工程研究所	甲、乙	材料力學	4 月 13 日	第二節 10:30 ~ 12:00	可攜帶計算機 P2-1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1. For the simple beam AB subjected to a uniform load of intensity  $w=5\text{kN/m}$  over a part of the span shown in Fig. 1, determine (a) the magnitude of the maximum bending moment and (b) the location where the maximum bending moment occurs? (20%)

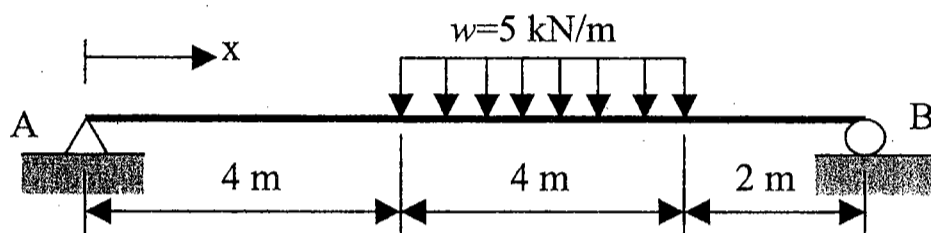


Fig. 1

2. For the uniform beam AB as shown in Fig. 2, (a) derive the equation of deflection curve, (b) determine the slope at B. (Note that the beam is statically indeterminate to the first degree.) (20%)



Fig. 2

3. A solid bar supports a horizontal force  $P=20\text{kN}$  acting at a distance  $d=0.2\text{m}$  from the axis of the bar. The length of the bar is  $h=1.0\text{m}$  and its diameter is  $0.1\text{m}$ . Find the principal tensile stresses and maximum shear stress at point A. (20%)

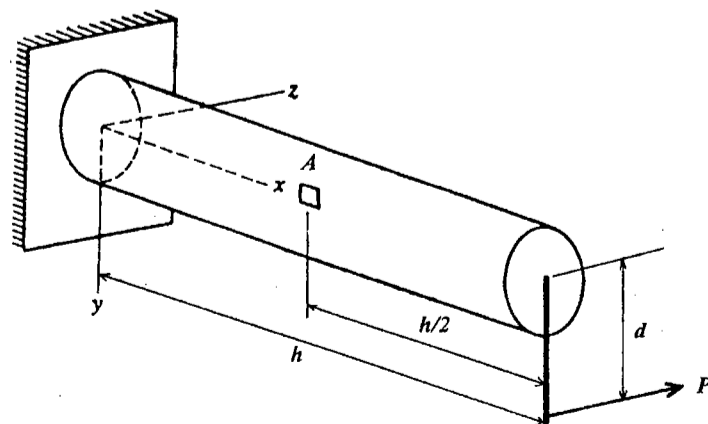


Fig. 3

4. Let  $F(x, y, z) = xy^2 - 4x^2y + z^2$ . Please find the directional derivative of  $F$  at  $(1, -1, 2)$  in the direction of  $6i + 2j + 3k$ . (15%)

5. Please find the Fourier series of the following function assumed to have the period  $2\pi$ . (20%)

$$f(x) = \begin{cases} k, & -\frac{\pi}{2} < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$$

6. A particle moves once counterclockwise about the circle of radius 6 about the origin, under the influence of the force  $F = (e^x - y + x \cosh(x))i + (y^{3/2} + x)j$ . Please calculate the work done by this force. (15%)

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4. A solid circular shaft AC of two different diameters is attached to a fixed base at C and is subjected to the torques shown in Fig. 4. Derive the equation that represents the twist angle  $\phi_A$  at point A in terms of  $G, d_a, d_b, T_a, T_b, L_a, L_b$ . (20%)

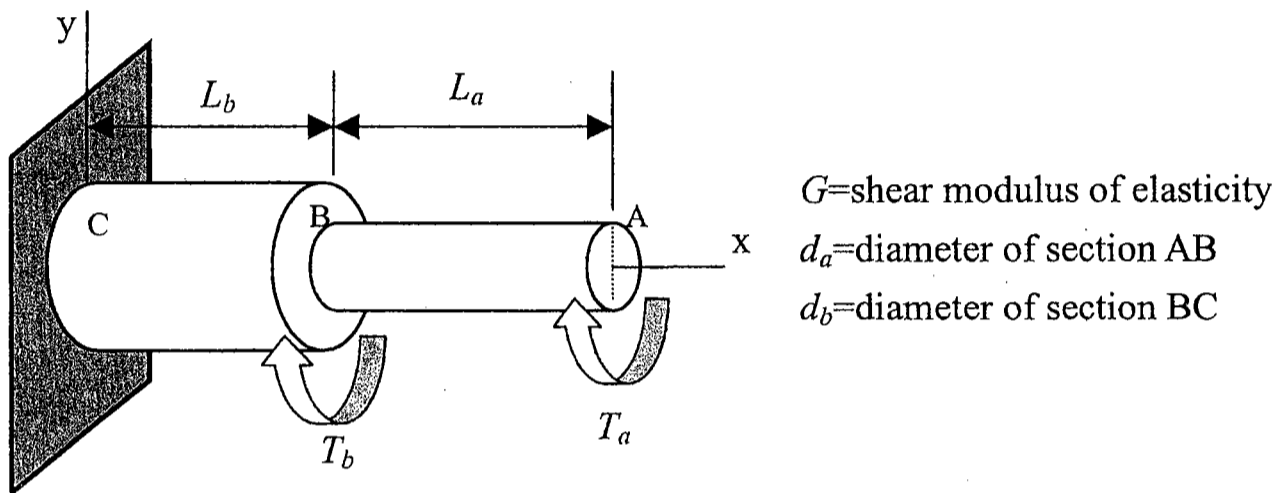


Fig. 4

5. An element in plane stress is subjected to stresses  $\sigma_x = 5000 N/cm^2$ ,  $\sigma_y = 3000 N/cm^2$ ,  $\tau_{xy} = 1000 N/cm^2$ , as shown in Fig. 5. Determine the principal stresses and principal planes by using Mohr's circle. (20%)

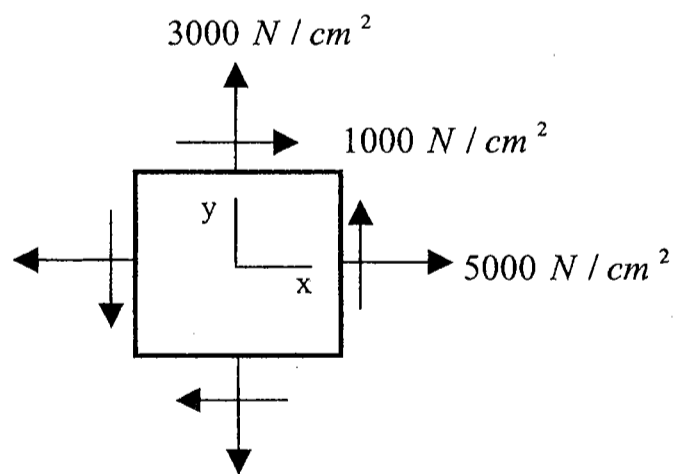


Fig. 5