

國立勤益技術學院九十五學年度研究所一般招生筆試試題卷

所別：精密機械與製造科技研究所 組別：

科目：材料力學

准考證號碼：□□□□□□□□ (考生自填)

考生注意事項：

- 一、考試時間 100 分鐘。
- 二、可攜帶無記憶裝置之電子計算機。
- 三、試題並非平均配分。

試題一：〈10 分〉

Determine the equivalent state of stress if an element is oriented 60° counterclockwise from the element shown in Fig. 1.

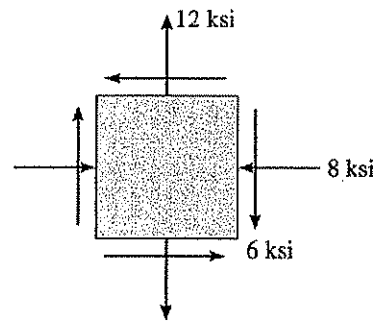


Fig. 1

試題二：〈20 分〉

The solid rod shown in Fig. 2 has a radius of 0.75 in. If it is subjected to the loading shown, determine the state of stress at point A.

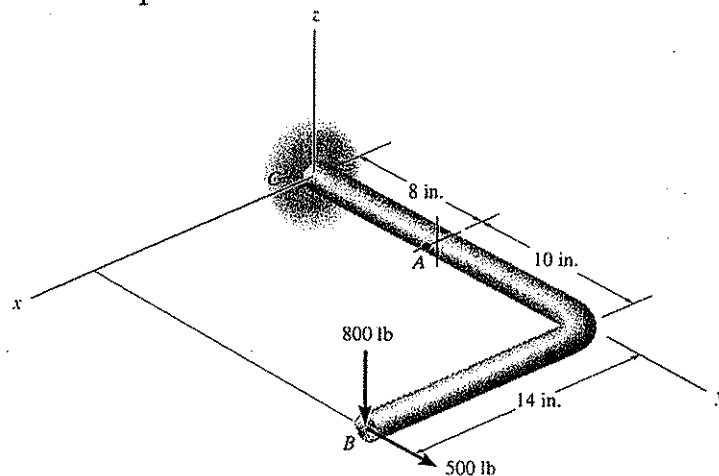


Fig. 2.

試題三：〈20分〉

The 50-mm-diameter cylinder is made from Am 1004-T61 magnesium and is placed in the clamp when the temperature is $T_1 = 20^\circ\text{C}$. If the 304-stainless-steel carriage bolts of the clamp each have a diameter of 10 mm, and they hold the cylinder snug with negligible force against the rigid jaws, determine the force in the cylinder when the temperature rises to $T_2 = 130^\circ\text{C}$. Take $\alpha_{\text{mg}} = 26(10^{-6})/^\circ\text{C}$, $E_{\text{mg}} = 44.7\text{GPa}$, $\alpha_{\text{st}} = 17(10^{-6})/^\circ\text{C}$, $E_{\text{st}} = 193\text{GPa}$.

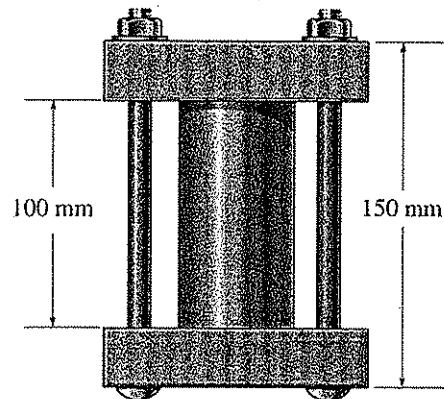


Fig. 3

試題四：〈20分〉

The beam is made from three boards bonded with glue and is subjected to the loading shown in the figure.

- Draw the shear and bending diagrams (5%)
- Determine the maximum the stress occurred in the beam (5%)
- Determine the required strength of the glue to avoid the failure of the interface. (A safety factor of 1.2 is assumed in this case) (10%)

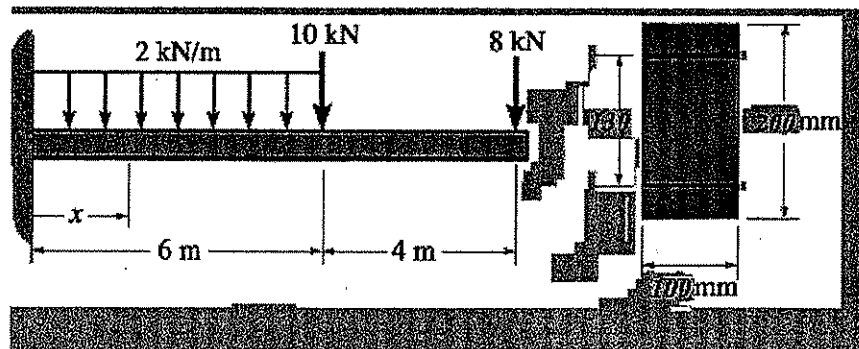


Fig. 4

試題五：〈 30 分 〉

The steel pipe shown in figure has an inner diameter of 60 mm and outer diameter of 80 mm. The yield strength of the steel is $\sigma_y = 250\text{MPa}$. If it is subjected to a torsional moment of 8 kN·m and a bending moment of 3.5 kN·m,

- (a) Draw stress state of point B at outer surface (10%)
- (b) Determine the maximum tensile stress and shear stress occurred in pipe. Draw Mohr's circle for this case. (10%)
- (c) Apply the maximum-distortion-energy theory and maximum-shear-stress theory, respectively, to define the safety factors. (10%).

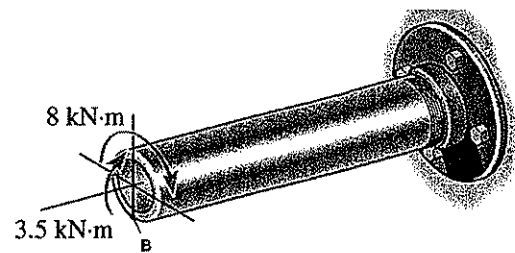


Fig. 5