

淡江大學八十九學年度碩士班招生考試試題

系別：機械工程學系

科目：材料力學

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本試題雙面印製

1. Answer the following questions:

- (a) (5%) Indicate the upper yield point σ_{UYP} and lower yield point σ_{LYP} on the typical stress-strain curve for a low-carbon steel.
- (b) (5%) What is the ultimate strength σ_{ULT} ?
- (c) (5%) Explain the ductile material and brittle materials by using the ultimate strain and yielding strain?
- (d) (5%) What is the maximum shear stress criterion (Tresca)?
- (e) (5%) What is the relation among the shear force $V(x)$, load intensity $w(x)$, and the bending moment $M(x)$ of a beam?

2. (20%) A machine part (Figure 1) in bending has a moment of 25,000 lb-in. applied to it. The member is a flat bar of mild steel with yield stress of 36 ksi. The member has two different depths of 6 in. and 4 in. and has a thickness of 1 in. The radius of the fillet in the transition region is 1 in. Determine the maximum bending stress. Include stress concentration effects.

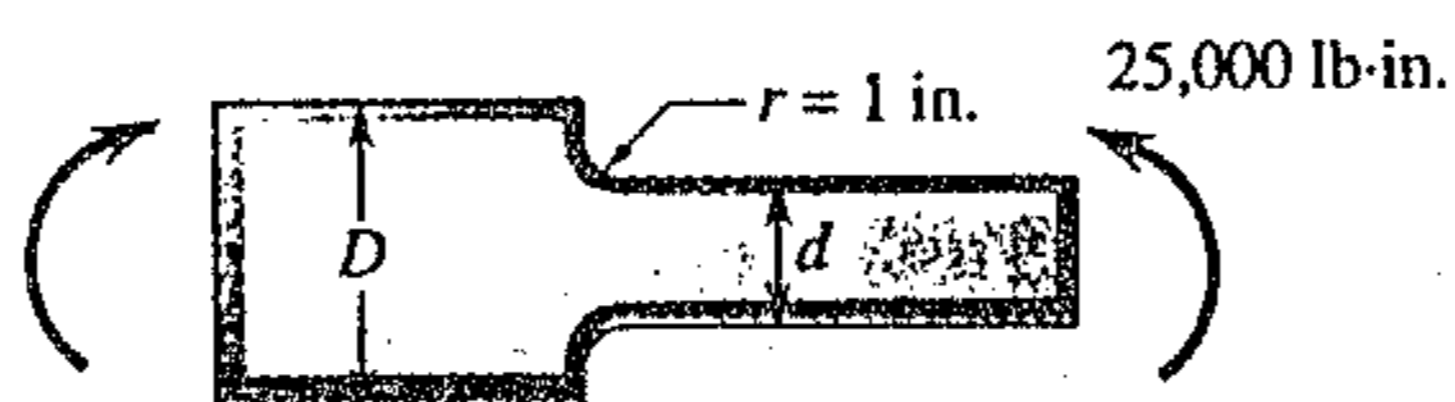
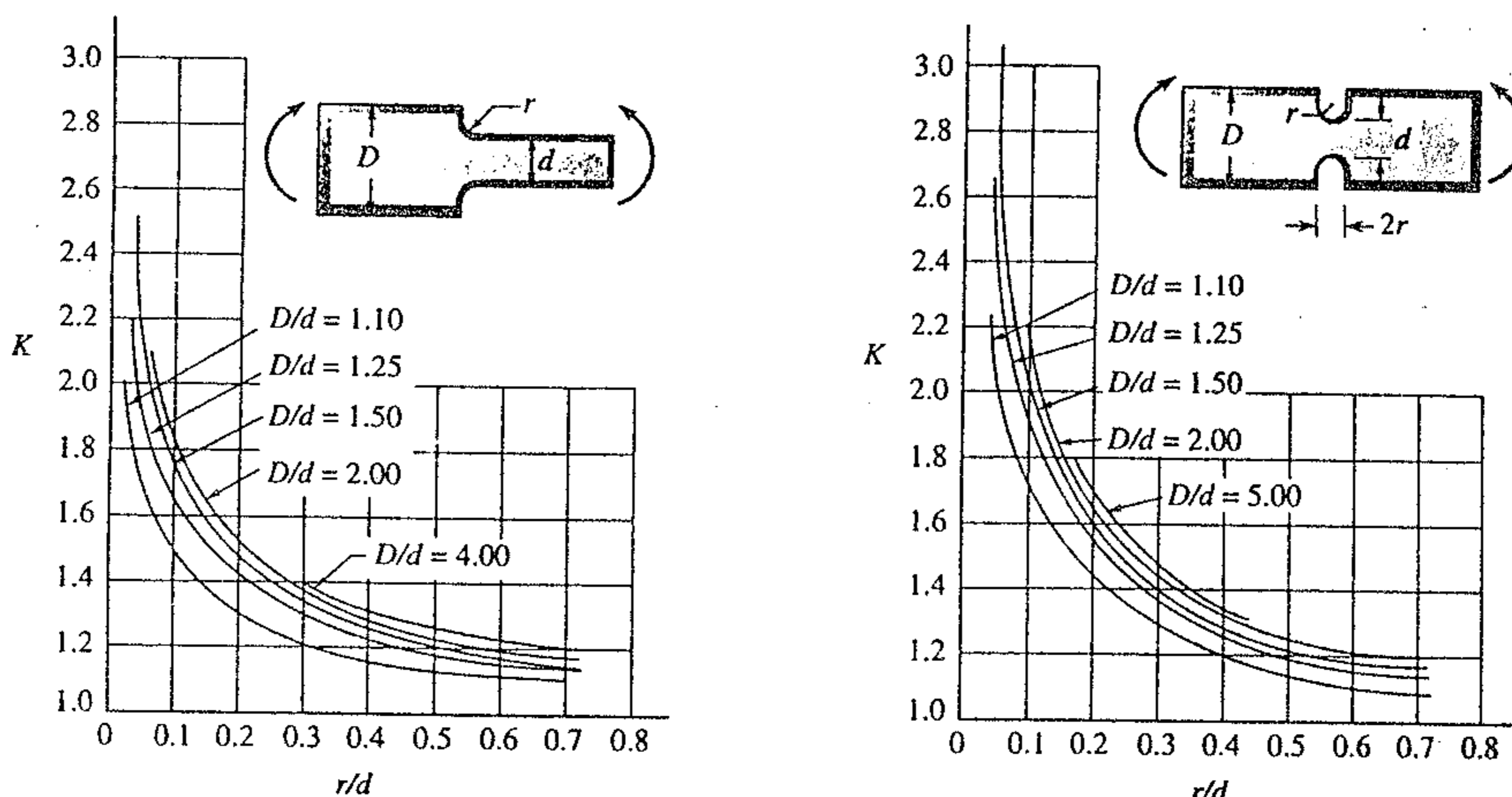


Figure 1



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3. (30%) The axle of an automobile is subjected to the forces and torque shown in Figure 2. The diameter of the axle is 32 mm. Determine the shear stress at (a) point A on top of the axle, and (b) point B on the side of the axle.

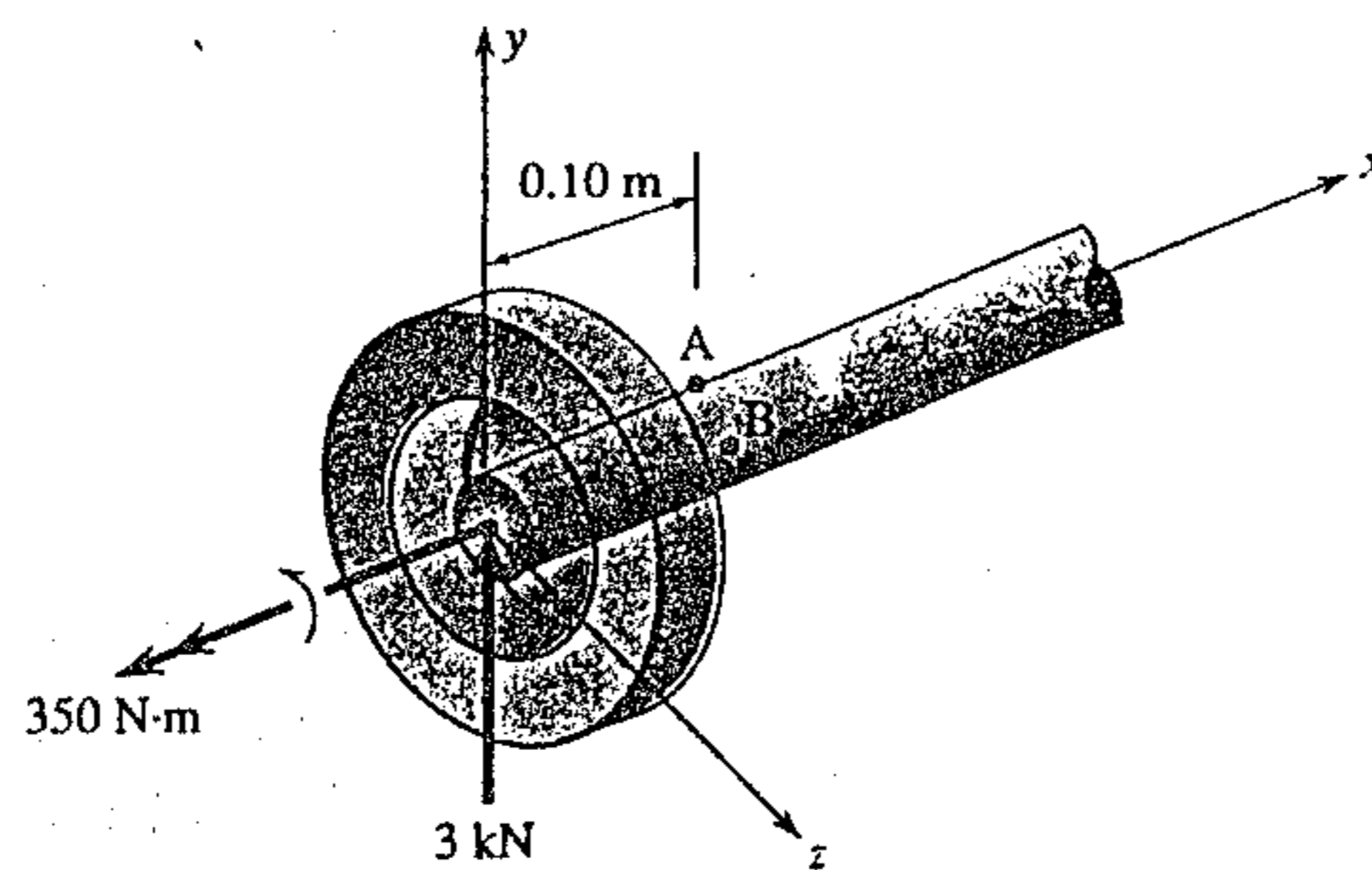


Figure 2

4. (25%) The axle of an automobile is subjected to the normal forces and a torque producing the state of stress shown in figure 3. Determine the principal stresses and principal angles. Show a sketch of the element oriented with the principal stresses acting on it.

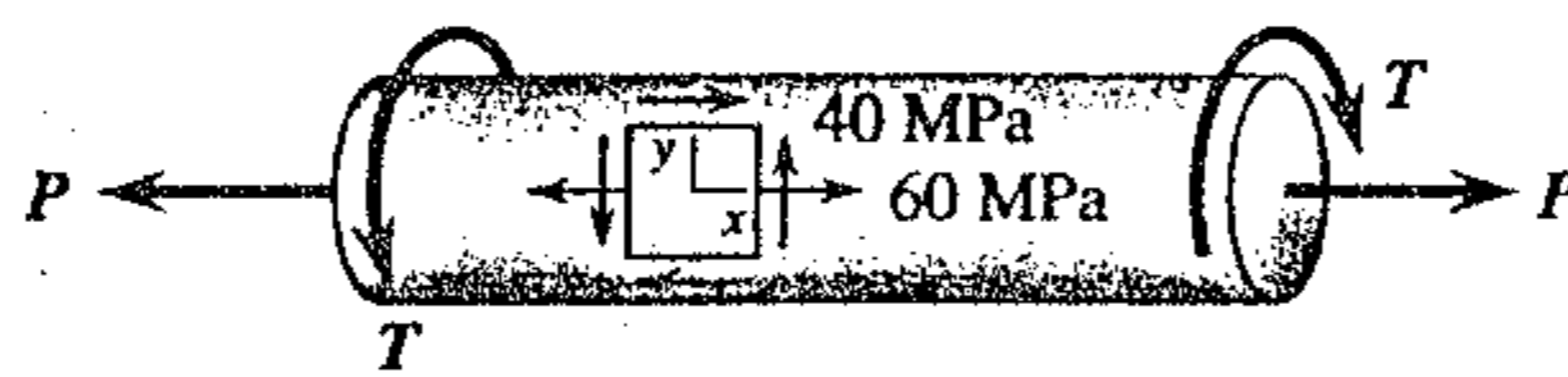


Figure 3