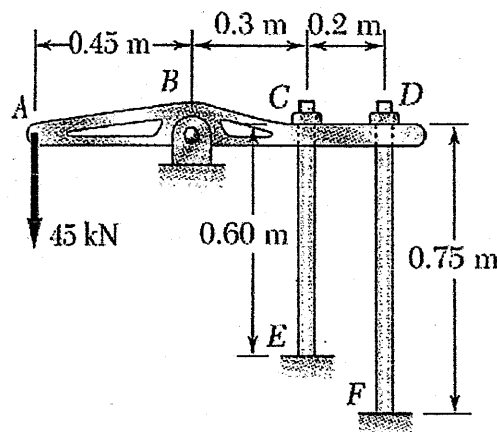


※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

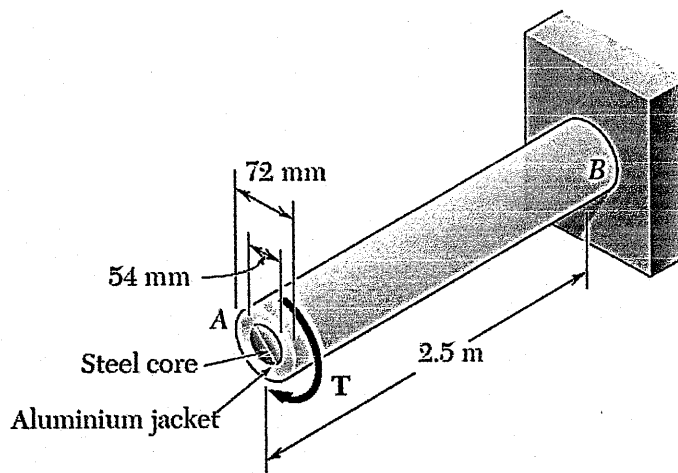
1. (20pts) Explain the following terms:

(a) 0.2% offset yield stress, (b) strain hardening, (c) anisotropic material (d) fatigue limit, (e) elastic section modulus, (f) maximum-distortion-energy criterion, (g) shear center, (h) strain rosette, (i) Castigliano's theorem, (j) Euler's formula.

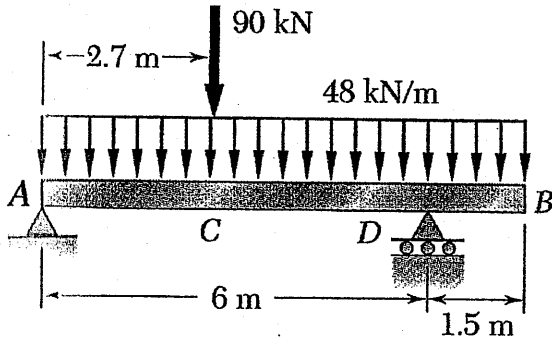
2. (20pts) The 12 mm-diameter rod CE and the 18 mm-diameter rod DF are attached to the rigid bar $ABCD$ as shown. Knowing that the rods are made of aluminum and using $E = 73 \text{ GPa}$, determine (a) the force in each rod caused by the loading shown, (b) the corresponding deflection of point A .



3. (20pts) A 4 kN-m torque T is applied at end A of the composite shaft shown. Knowing that the modulus of rigidity is 77 GPa for the steel and 27 GPa for the aluminum, determine (a) the maximum shearing stress in the steel core, (b) the maximum shearing stress in the aluminum jacket, (c) the angle of twist at A .



4. (20pts) The overhanging beam AB supports a uniformly distributed load of 48 kN/m and a concentrated load of 90 kN at C . Knowing that for the grade of steel to be used $\sigma_{\text{all}} = 165 \text{ MPa}$ and $\tau_{\text{all}} = 100 \text{ MPa}$, select the wide-flange shape which should be used.



Shape	$S \text{ } 10^3 \text{mm}^3$
W610 × 101	2530
W530 × 92	2070
W460 × 113	2400
W410 × 114	2200
W360 × 122	2010
W310 × 143	2150

5. (20pts) For the prismatic beam and loading shown, determine (a) the deflection at point D , (b) the slope at end A .

