系別：土木工程學系　　　　科目：工程力學(靜力學、材料力學)

准帶項目請打「○」否則打「×」
○　簡單型計算機

1. A solid circular bar ABCD is held against rotation at ends A and D and subjected to torques as shown in Figure 1. The two segments of the bar (AC and CD) have diameters 2 in. and 4 in., respectively. (a) Find the reaction at D. (b) Determine the maximum shear stress. (20%)
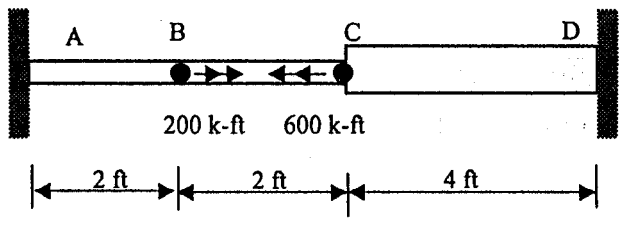

Figure 1

2. A bridge girder AB on a simple span of length L=15m supports a uniform load q that includes the weight the girder. The girder is constructed of three plates welded to form the cross section. The plates are joined by four fillet welds that run continuously for the length of the girder. Determine the maximum permissible load q based on (a) an allowable bending stress σ_{allow}=100 Mpa, (b) an allowable shear stress τ_{allow}=50 Mpa, and (c) an allowable shear load of 300 KN/m in each weld. (20%)
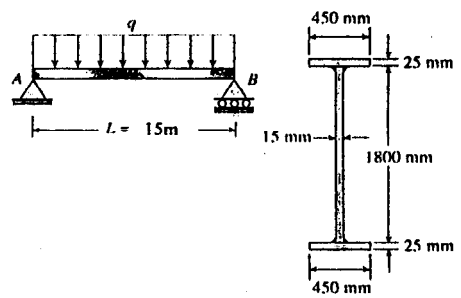

Figure 2

3. A beam has a hinge support at A and a roller support at B. The beam is subjected to the loading as shown in Figure 3. If the allowable vertical deflection at C is 2 in, find the maximum uniform load q. (Elastic modulus E=30,000 ksi, moment of inertia I=534 in^4)(20%)
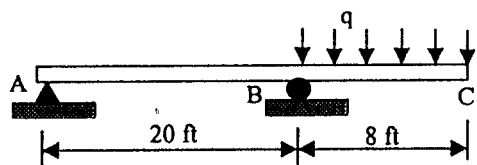

Figure 3

4. A cantilever beam of T-section is loaded by an inclined force of magnitude 20KN (see Figure 4). The line of action of the force is inclined at an angle of 60° to the horizontal and intersects the top of the beam at the end cross section. Determine the principal stresses and the maximum shear stress at point B in the web of the beam. (25%)

Figure 4

5. For the frame and loading shown in Figure 5, determine the components of all forces acting on member ABE. (15%)

Figure 5