## MEE3001 Design of machine elements E1+TE1

1

A semi-elliptic spring used for automobile suspension, consists of two extra full-length leaves and eight graduated-length leaves, including the master leaf. The centre-to centre distance between the two eyes is 1.6 m. The leaves are made of steel 55Si2Mo90 (S_{ut} = 1495 MPa and E = 206.5 GPa) and the factor of safety is 3. The maximum spring load is 37 kN. The leaves are pre-stressed so as to equalize stresses in all leaves under maximum load. Determine the dimensions of the cross-section of the leaves and the deflection at the end of the spring.

2

A welded connection of steel plates, as shown in Fig., is subjected to an eccentric force of 10 kN. Determine the throat dimension of the welds, if the permissible shear stress is limited to 75 N/mm2. Assume static conditions.
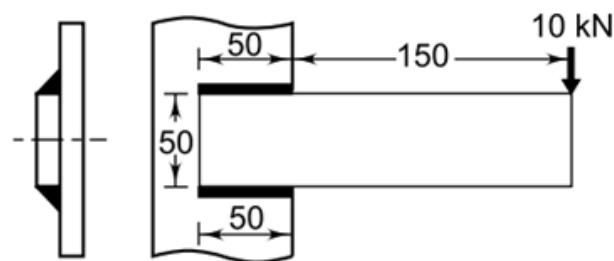
3

Design a cotter joint that can bear a maximum tensile load of 74 kN on the axial direction based on the distortion energy theory. Chose a suitable material and assume the factor of safety of the cotter as half that of the socket. Assume the compressive strength is two times the tensile strength in yielding.