CE21A/ME21A - 2004/05
Problem sheet #1

Qu.1
Determine the horizontal component of the displacement at joint C in Fig.1. All members have a cross-sectional area of 2500mm^2 and E = 200kN/mm^2. [u_C = 1.75mm left and v_C = 0.82mm down]

Qu.2
In Fig.2 find the vertical displacement that occurs at joint B as a result of a temperature change of +50˚F in members AD and DC. The coefficient of thermal expansion is α = 6.5 x 10^{-6} per ˚F. [v_B = 0.0976in up]

Qu.3
Find the displacement at joint C of the plane pin-jointed truss shown in Fig.3. Take L/A = 5000m^{-1} and E = 200kN/mm^2 for each member. [u_C = 15mm to right and v_C = 10mm down]

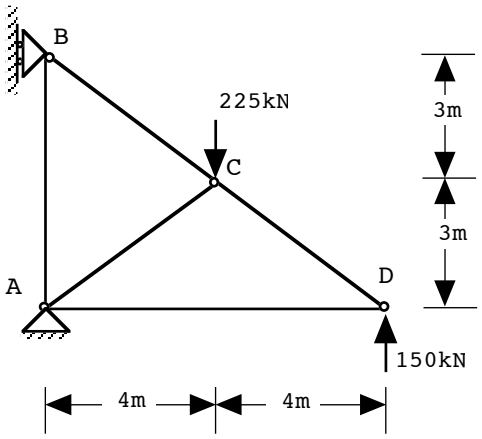


Fig.1

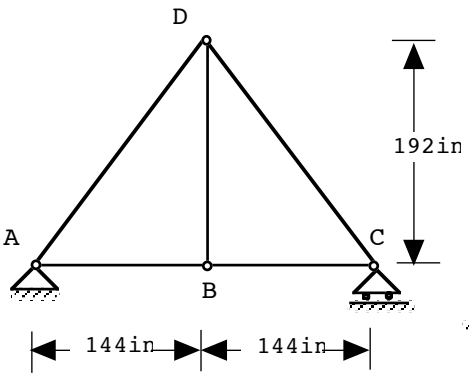


Fig.2

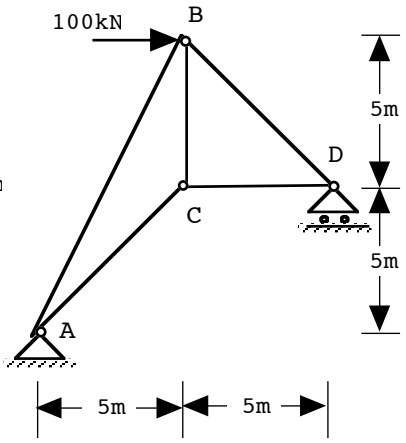
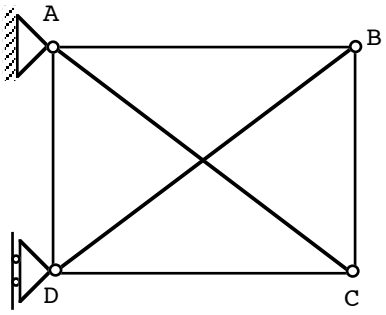


Fig.3

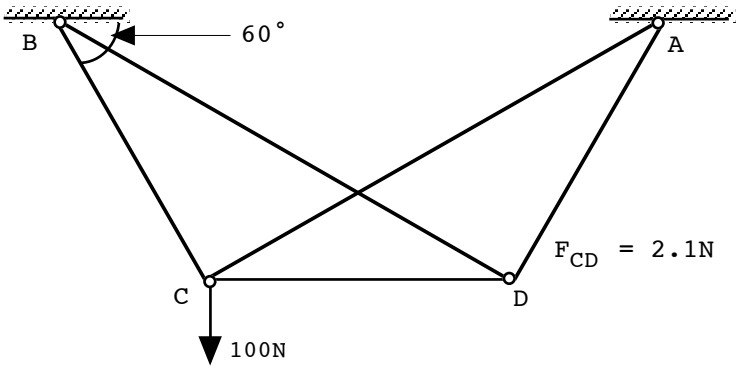
Qu.4
A plane pin-jointed framework consists of six bars forming a rectangle ABCD 4000mm by 3000mm with two diagonals as shown in Fig.4 below. The cross-sectional area of each bar is 200mm^2 and the frame is unstressed when the temperature of each member is the same. Due to local conditions the temperature of BC is raised by 30˚C. Calculate the resulting forces in all the members if the coefficient of linear expansion α of the bars is 7 x 10^{-6}/˚C. Take E equal to 200kN/mm^2.

Qu.5
Calculate the loads in the members of the singly redundant pin-jointed framework shown in Fig.5. The members AC and BD are 30mm^2 in cross-section, all other members being 20mm^2. in cross-section. The members AD,BC and DC are each 800mm long. Take E equal to 200kN/mm^2.



F_{BC} = 525N

Fig.4



F_{CD} = 2.1N

Fig.5

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