University Of Technology
Building and Construction Eng. Dept.
Final Exam – Second Attempt – 2010/2011

Subject : Strength of Materials. **Date: 29/ 05/ 2011**
Class : Second Year. **Time : 3 Hours**

Note: Answer **FOUR** questions only.

Q1: A wooden box beam is to be constructed by nailing four pieces in one of the two ways shown in Fig.(Q1). The allowable bending and shear stresses in the wood are 6 MPa and 2 MPa respectively. The maximum force that the nails can support is 500 N. Determine the maximum value of load P, the spacing of the nails, and the preferred nailing method.

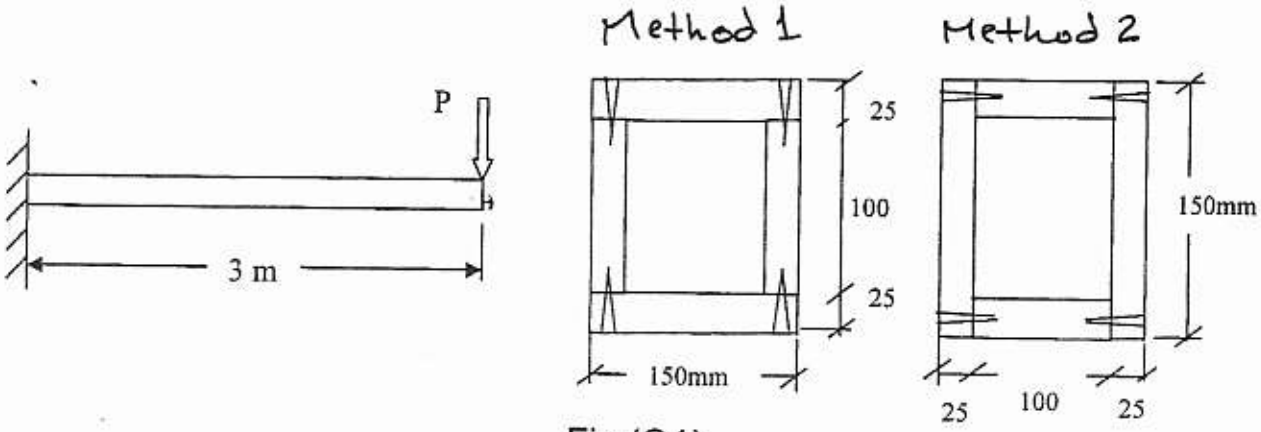

Fig.(Q1)

Q2: A simply supported beam of 4m span carries loads as shown in Fig.(Q2). At a section 1.5m from left support find either (a) or (b):

a) the bending and shearing stresses at the neutral axis and the top edge of section, also find the principal stresses with their planes at these points.
b) the maximum magnitude of the normal and shearing stresses, and plot the normal and shear stress distribution acting over the section.

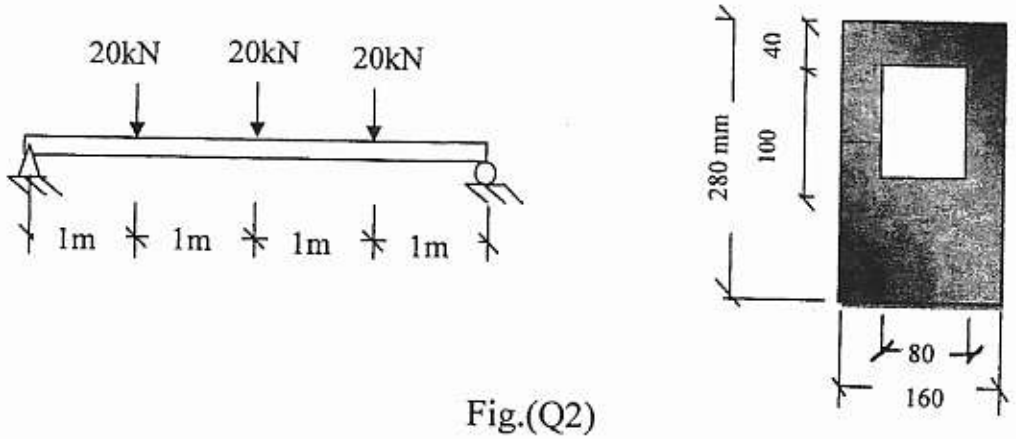

Fig.(Q2)

Q3: A steel shaft and aluminum tube are connected to a fixed support and a rigid disk as shown in Fig.(Q3). A torque T=(5 KN.m) is applied to the disk. Determine the thickness of the the aluminum tube(t)if the allowable shear stress are 120 MPa in steel and 76 MPa in aluminum and the angle of rotation of the disk is limited to 2°.For steel G=83GPa,and for aluminum G=28MPa.

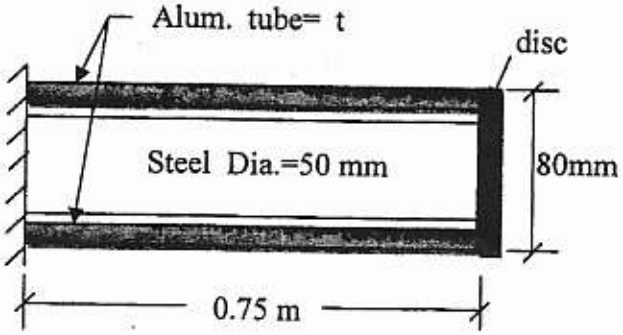

Fig.(Q3)

Q4: Determine the slope at point A and the maximum deflection of the beam shown in Fig.(Q4), using the Moment- area method. EI is constant.

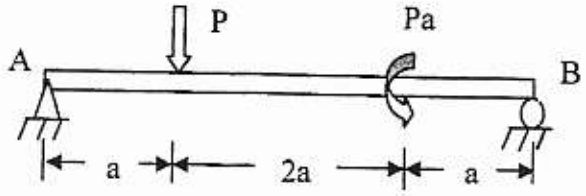

Fig.(Q4)

Q5: Three steel bars A, B, and C (E=200 GPa) have lengths L_A= 4m, L_B= 3m, and L_C= 2m as shown in Fig.(Q5). All bars have the same cross-sectional area of 500mm^2. Determine (1) the elongation in bar B;
(2) the normal stress in bar C.

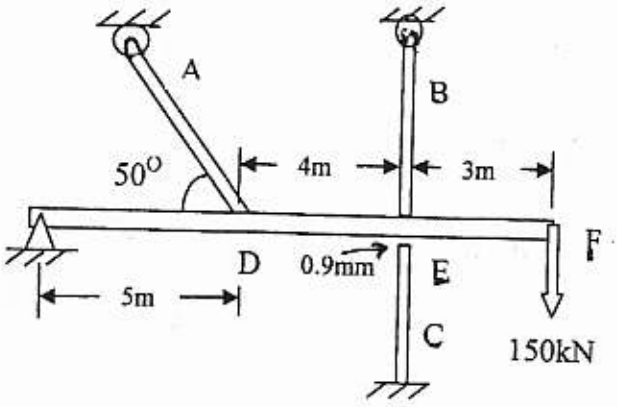

Fig.(Q5)