Mansoura University

Faculty of Engineering

Department: Production Eng. and Mechanical Design

Year: 1st year

course: Strength of Materials

Code: PRE 5122

Time: 3 hours

Date: 11/6/2014

Question One: ***(15 Marks)***

Compute the shearing stress in the pin at B for the member supported as shown in Fig. 1. The pin diameter is 20 mm.

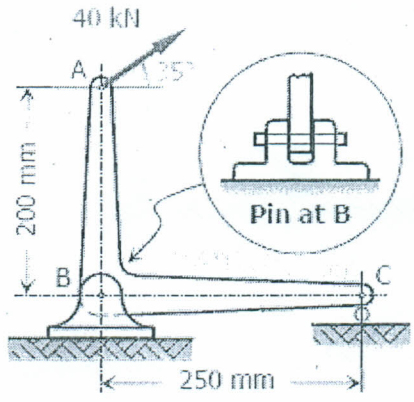

Fig. 1

Question Two: ***(15 Marks)***

A 1.5 m long tubular steel shaft of 38 mm outer diameter d_1 and 30 mm inner diameter d_2 is to transmit 100 KW between a turbine and a generator. Determine the minimum frequency at which the shaft can rotate, knowing that G = 77.2 GPa, that the allowable shearing stress is 60 MPa, and the angle of twist must not exceed 3^o

Question Three: ***(20 Marks)***

A single horizontal force P of 150 lb magnitude is applied to end D of lever ABD which shown in Fig. 2. Determine ***(a)*** *the normal and shearing stresses on an element at point H having sides parallel to the x and y axes,* ***(b)*** *the principal planes and principal stresses at the point H.*

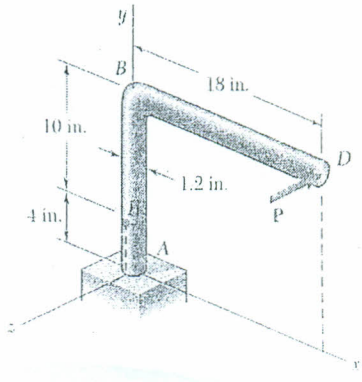

Fig. 2

Question Four: ***(20 Marks)***

The structure shown in Fig. 3 is constructed of a W10x112 rolled-steel beam. (a) Draw the shear and bending-moment diagrams for the beam and the given loading. (b) Determine normal stress in sections just to the right and left of point D. For a W10x112 rolled steel shape, the section modulus equals 126 in^3 about the X-X axis.

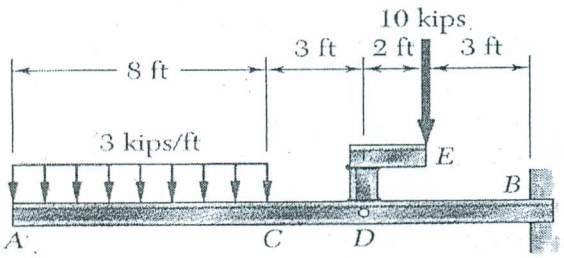

Fig. 3

Question Five: ***(20 Marks)***

Two steel plates of uniform cross section 10 × 80 mm are welded together as shown in Fig. 4. Knowing that centric 100-kN forces are applied to the welded plates and that the in-plane shearing stress parallel to the weld is 30 MPa, determine (a) the angle β, (b) the corresponding normal stress perpendicular to the weld. (Using Mohr's circle)

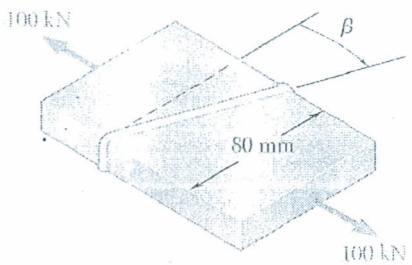

Fig. 4