Fayoum University
Faculty of Engineering
Industrial Engineering Department

Stress Analysis
Time (3 hours)
1st Semester - 2015/2016

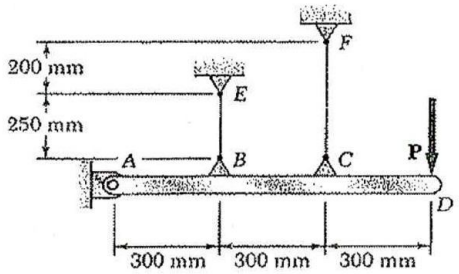
Final Exam (2nd Year Industrial)
Stress Analysis

Date: 17/01/2016 Time: 09:30 am– 12:30 pm
Total grade: 100 points

***Notes**: 1. Answer all questions*
2. Allowable aids are calculator, drawing tools, and included data sheet

Question No. (1); (15 points; 5+5+5)

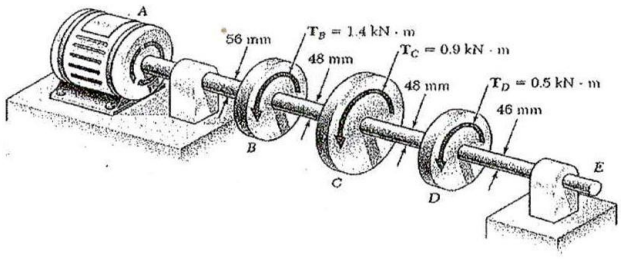
The rigid bar AD is supported by two steel wires of 1.5 mm diameter (E=200 GPa) and a pin and bracket at A. Knowing that P=900 N, determine: (a) Stress in each wire,
(b) Deflection at points B and C, and (c) Corresponding deflection at point D



Question No. (2); (15 points; 5+10)

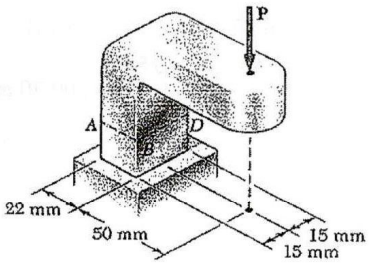
A- A compression coil spring made of an alloy steel is having the following specifications; mean diameter of coil=50 mm, wire diameter=5 mm, number of active coil=20. If the spring is subjected to an axial load of 500 N, calculate the maximum shear stress (neglect the curvature effect) to which the spring material is subjected.

B- Under normal operating conditions, the electric motor exterts a torque of 2.8 KN.m on shaft AB as in the figure. Knowing that each shaft is solid, determine: (a) The torue in each shaft AB, BC, and CD, and (b) The maximum shearing stress in each shaft AB, BC, and CD



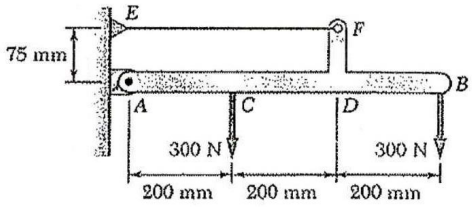
Question No. (3); (15 points)

Knowing that the allowable stress in section ABD is 70 MPa, determine the largest P that can be applied to the bracket shown.



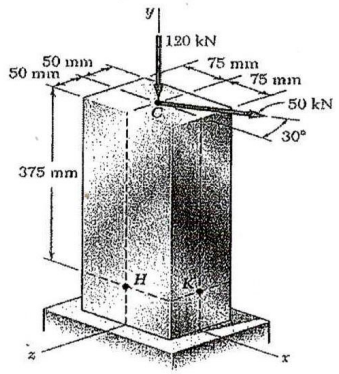
Question No. (4); (20 points)

Draw the shear and bending moment diagrams for the beam and loading shown, and determine the maximum absolute value of (a) the shear and (b) the bending moment.



Question No. (5); (20 points)

For the post loading shown, and at point H, determine (a) the principle stresses, (b) principle planes, and (c) the maximum shearing stress.



Question No. (6); (25 points; 5+10+10)

A- Two f Drive an expression for the stresses ($\sigma_1,\sigma_2,\sigma_3$) in a pressure vessel due to internal pressure P.

B- Cylindrical pressure vessel has an inner diameter of 1.2 m and thickness of 12 mm. Determine the maximum internal pressure it can sustain so that neither its circumferential nor its longitudinal stress component exceeds 140 MPa. Under the same conditions, what is the maximum internal pressure that a similar-size spherical vessel could sustained?

C- A bar assembly is constrained at one end and loaded with force F at the freeend as shown in figure. The assembly consists of two bars with lengths and areas as shown in the figure. If the elements are of the same material with modulus of elasticity E, determine:

a- Select the Element Types and a Displacement Function

b- Define the Strain/Displacement & Stress/Strain Relationships

c- Derive the Element Stiffness Matrix & Equations

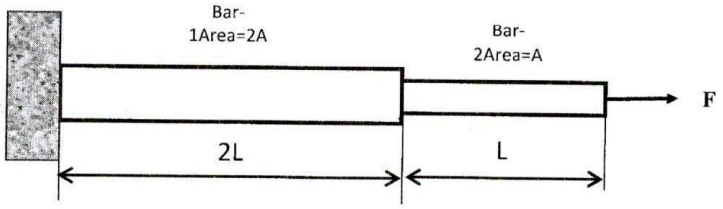
d- Assemble the Element Equations to Obtain the Global stiffness matrix.

e- Introduce Boundary Conditions

f- Solve for the Unknown Degrees of Freedom

g- Find elements Strains& Stresses.

h- Interpret the Results



THE END
BEST WISHES