Kafrelsheikh University		**Semester: 1st Semester**
Mechanical Engineering		**Final Examination**
Dept. Mechanical Engineering		**Date: Dec 29th, 2018**
Year: Preparatory Year		**Time allowed: 3 hour**
Instructor: Assoc. Prof. Fawzy **Assoc. Prof. Mahar** **Assist. Prof. Magda**		**Full Mark: 70**
Subject: Engineering Mechanics (1)_Statics (MEP0001)		
Questions and Answers Booklet		

(a) This exam measures ILOs no.: a1, b2, b3, b11, c1, and d3
(b) No. of pages: 8 - No. of questions: 7. Page no 3/5, 5/8. And 8/8 are empty.
(c) This is a close book exam.
(d) Clear, systematic answers and solutions are required. In general, marks will not be assigned for answers and solutions that require unreasonable (in the opinion of the instructor) effort to decipher.
(e) Ask for clarification if any question statement is not clear to you.
(f) Attempts in all questions.
(g) The weight of each problem is indicated.
(h) The exam will be marked out of 70. There are 9 marks bonus.

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1. A) Convert 5000 lb_f/in^2 to Pa (1 Pa=1 N/m^2). **(3 Marks)**

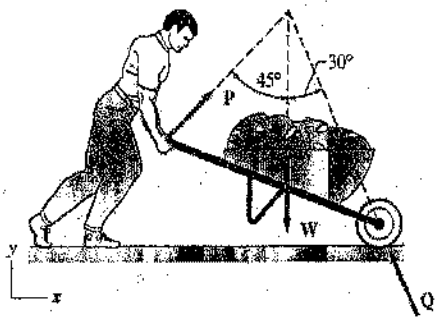
B) Compute the magnitude F of the force which the earth exerts on the sun. Perform the calculation first in Newton and then convert your result to pounds. The mass the earth is $m_e = 5.9742\times10^{24}$ kg and mass of moon is 33000 times of earth. The mean distance between the earth and sun (center to center) is 149.6×10^6km. **(4 Marks)**

Solution

With our best wishes

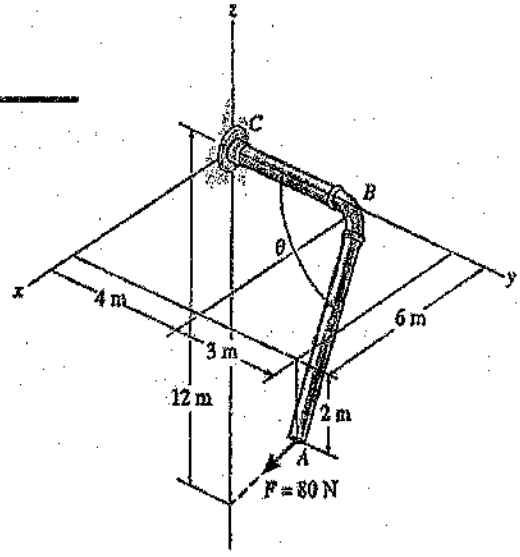
Assoc. Prof. Fawzy A. Shaban *F. A. Shaban*
Assoc. Prof. Maher M. Abou Al-Sood *M. M. Abou Al-Sood*
Assist. Prof. Magda El-Fakharany. Kotob *M. E. Kotob*

2. The man exerts a force **P** of magnitude 50 lb on the handles of the wheelbarrow. Knowing that the resultant of the forces **P**, **Q** (the reaction at the wheel), and **W** (the weight of the wheel barrow) is the force **R** = 10 **i** lb, determine **W**. **(8 Marks)**



Solution

3. Determine the projected component of the 80 N force acting along the axis AB of the pipe and perpendicular to it. **(12 Marks)**.



Solution

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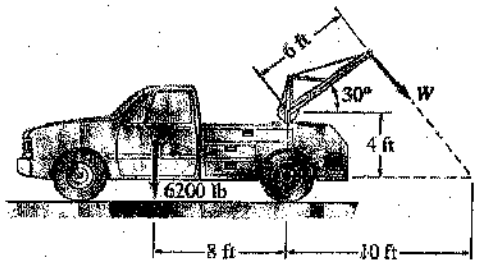
4. The tow truck's front wheels will be lifted off the ground if the moment of the load W about the rear axle exceeds the moment of the 6200-lb weight of the truck. Determine the largest W that may be safely applied. **(6 Marks)**

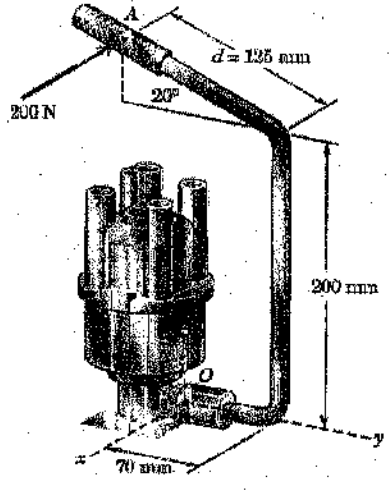


Solution

5.

a) The specialty wrench shown in the figure is designed for access to the hold-down bolt on certain automobile distributors. For the configuration shown where the wrench lies in a vertical plane and a horizontal 200-N force is applied at A perpendicular to the handle, calculate the moment M_O applied to the bolt at O. For what value of the distance d at which z-components of M_O is zero? **(6 Marks)**

b) Replace this system to a wrench and find its force, moment, pitch, and its intersection with x-y plan? **(9 Marks)**



Solution

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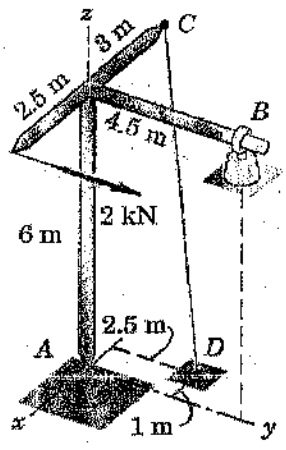
6. The welded tubular frame is secured to the horizontal x-y plane by a ball-and-socket joint at A and receives support from the loose-fitting ring at B. Under the action of the 3-kN load, rotation about a line from A to B is prevented by the cable CD, and the frame is stable in the position shown. Neglect the weight of the frame compared with the applied load and determine the tension T in the cable, the reaction at the ring, and the reaction components at A. **(17 Marks)**



Solution

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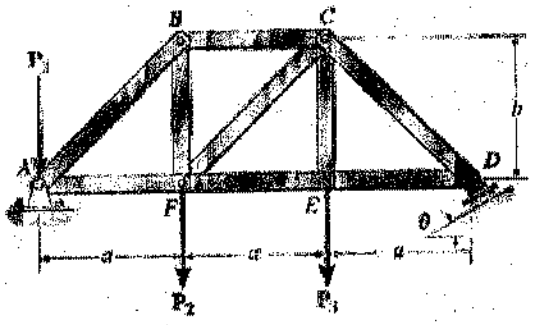
7. a) What is meant by zero force members, mention the three cases for zero internal forces? **(5 Marks)**



b) Determine the force in eah member of the truss and state if the members are in tension or compression. Set P_1= 100 lb , P_2= 200 lb, P_3= 300lb, a=b=10 ft , θ= 30° **(9 Marks)**

Solution

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