



- (a) No. of pages: 3 and no. of questions: 7
- (b) This is a close book exam.
- (c) Clear, systematic answers and solutions are required. In general, marks will not be assigned for answers and solutions that require unreasonable effort to decipher.
- (d) Ask for clarification if any question statement is not clear to you.
- (e) Solve all questions.
- (f) The exam will be marked out of 70. There are 5 marks bonus.

1. If $\phi = 30^\circ$ and the resultant force acting on the gusset plate is directed along the positive x axis, determine the magnitudes of F_2 and the resultant force. (10 Marks)

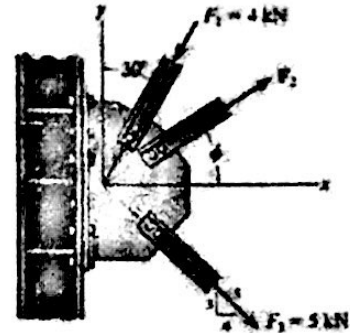


Fig. 1 Schematic Diagram of Prob. # 1

2. Three forces act on the ring. If the resultant force F_R has a magnitude and direction as shown, determine the magnitude and the coordinate direction angles of force F_3 . (10 Marks)

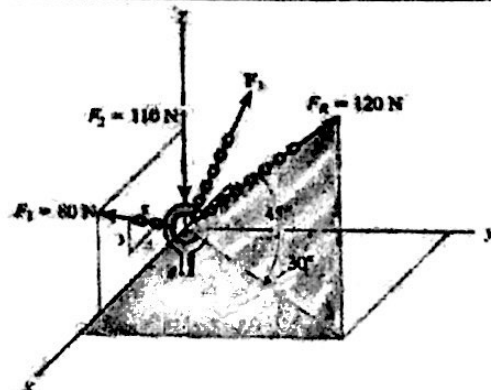


Fig. 2 Schematic Diagram of Prob. # 2

3. The flanged steel cantilever beam with riveted bracket is subjected to the couple and two forces shown, and their effect on the design of the attachment at A must be determined. Replace the two forces and couple by an equivalent couple M and resultant force R at A . (10 Marks)

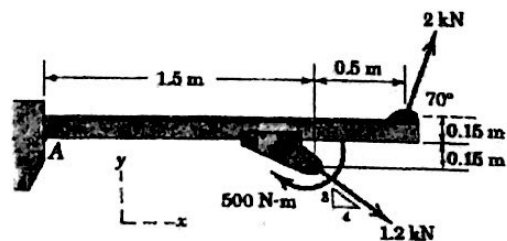


Fig. 3 Schematic Diagram of Prob. # 3

4. The shear leg derrick is used to haul the 200 kg net of fish onto the dock. Determine the compressive force along each of the legs AB and CB and the tension in the winch cable DB. Assume the force in each leg acts along its axis. (10 Marks)

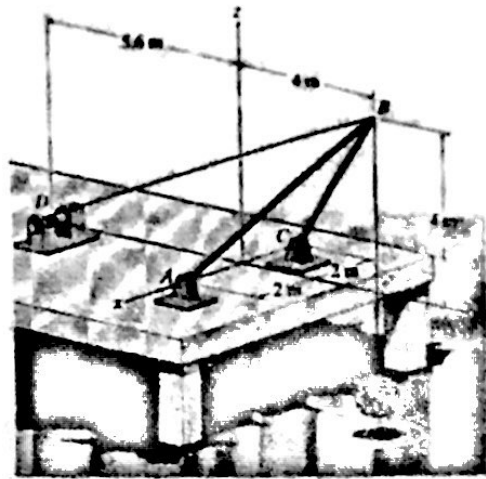


Fig. 4 Schematic Diagram of Prob. # 4

5. The resultant of the two forces and couple may be represented by a wrench. Determine the vector expression for the moment M of the wrench and find the coordinates of the point P in the x - z plane through which the resultant force of the wrench passes. (10 Marks)

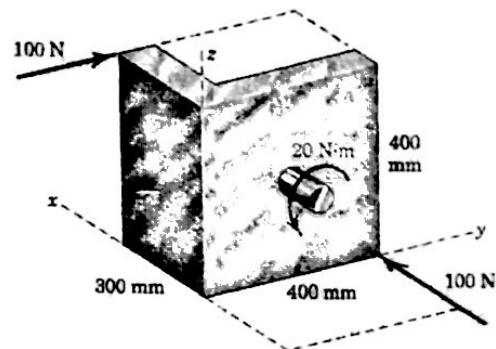


Fig. 5 Schematic Diagram of Prob. # 5

6. Calculate the magnitude of the force supported by the pin at A under the action of the 1.5-kN load applied to the bracket. Neglect friction in the slot. (10 Marks)

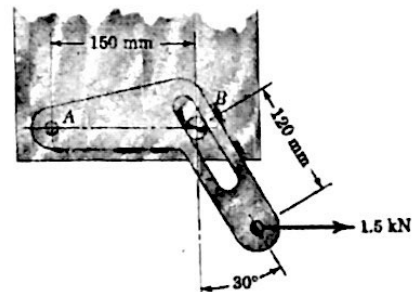


Fig. 6 Schematic Diagram of Prob. # 6

7. Consider the loaded truss structure, as shown in Figure 7, which is supported by a pin at joint **H** and a roller at joint **I**. (15 Marks)
- Determine the supports reactions at **H** and **I**.
 - Identify all the zero-force members in the truss by inspection.
 - Use the **method of sections** to calculate the internal forces in members **DF**, **FK**, **JK**.
 - Use the **method of joint** to calculate the internal forces in members **BL** and **DL**.
(In (c) and (d), state whether considered members are in tension or compression.)

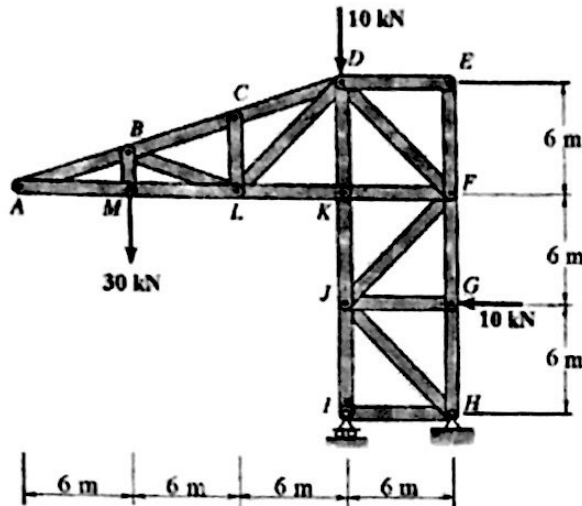


Fig. 7 Schematic Diagram of Prob. # 7

END OF QUESTIONS