

UNIVERSITY OF TORONTO
Faculty of Applied Science and Engineering
CIV 100S – MECHANICS
Final Examination
23rd April 2010
Examiner: Michael Seica
Time allowed: 2½ hours

FAMILY NAME: _____ **GIVEN NAME(S):** _____
(Please print clearly)

STUDENT NUMBER: _____

CIRCLE MODEL NUMBER OF YOUR CALCULATOR:

CASIO 260 TEXAS INSTRUMENTS 30 SHARP 520

- NOTES:**
- 1. Make sure you have all 7 sheets of the examination paper. Page 7 is blank.
 - 2. If you need more space for a question, please use the back of the preceding question. In all cases, please indicate clearly where your calculations are continued.
 - 3. Answer all 5 (five) equal-value questions.
 - 4. The only calculators permissible are listed above. Please circle your model.
 - 5. No other paper will be accepted for marking or allowed on the desk.
 - 6. Do not remove the staple.
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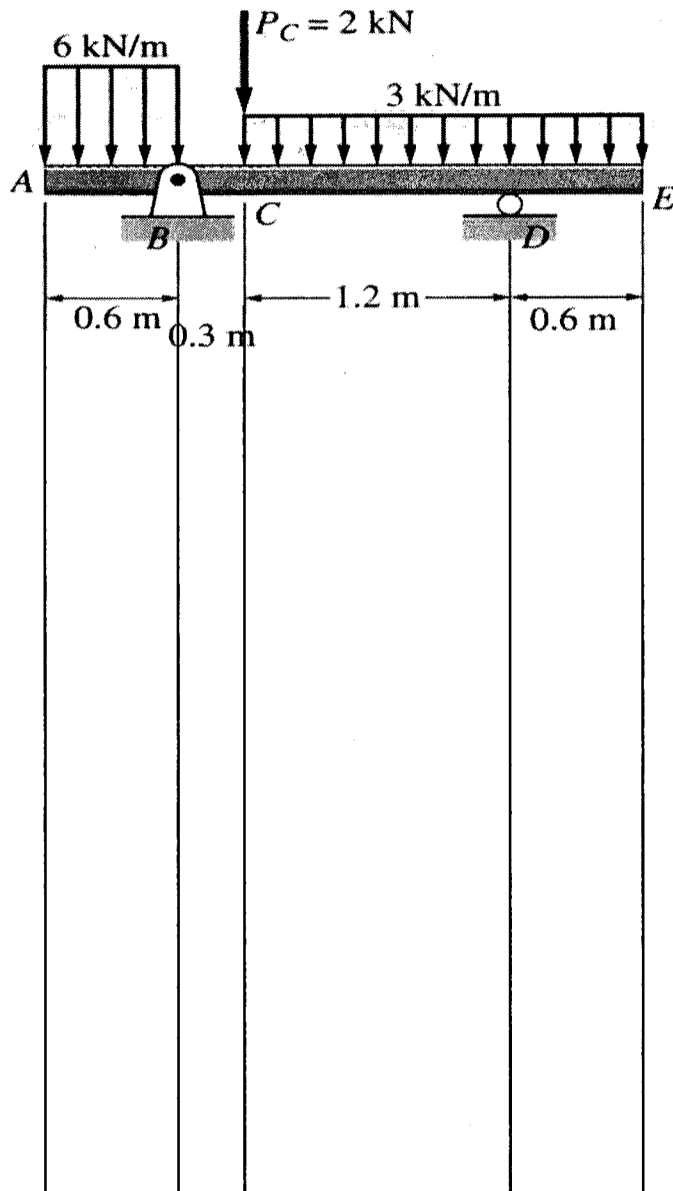
DO NOT WRITE IN THIS SPACE.

1	/12
2	/12
3	/12
4	/12
5	/12
TOTAL	/60

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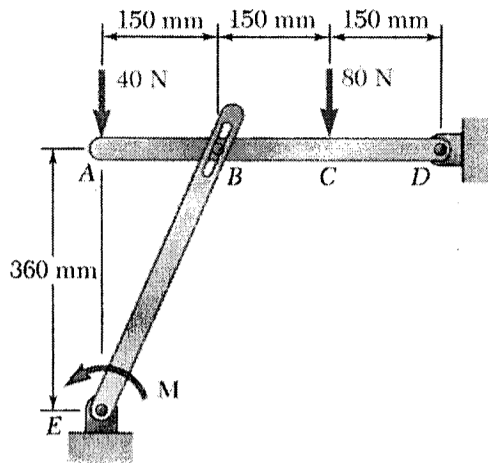
1. Draw the shear and bending moment diagrams for the beam loaded as shown, and indicate values at all 'critical' points. Assuming the beam is made of wood having a failure stress of 30 MPa, determine the dimensions of the beam cross-section, if the width of the beam is twice its depth. The lumberyard can saw-cut timber in multiples of 20 mm only. The load factor for wood in bending is 2.0. Is this beam used, in your opinion, efficiently?



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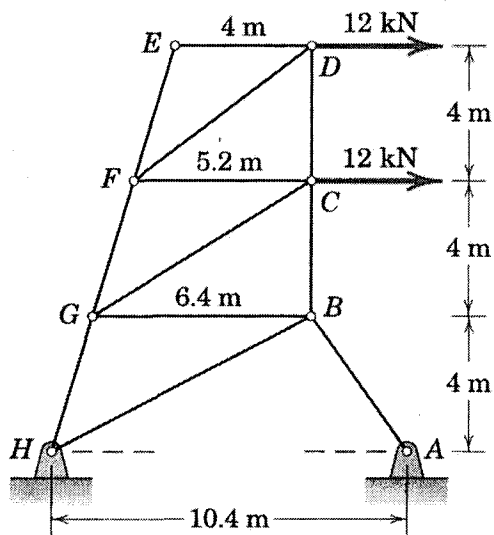
2. The pin at B is attached to member $ABCD$ and can slide along a slot cut in member BE . If all connections are frictionless, determine the couple M required to hold the system in equilibrium.



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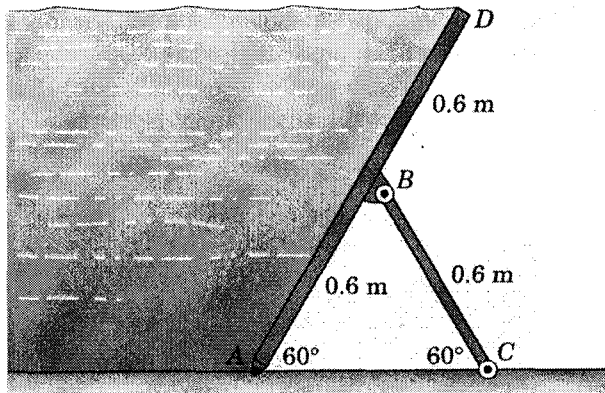
3. For the truss below, calculate the forces in members CF and CG , and indicate the zero-force members, if any. Determine the required size for member CG , if it has to be made of square solid steel bar, from material that is available in 2 mm increments. Also, determine the elongation of member CG . The modulus of elasticity for steel is 200,000 MPa, the yield stress is 300 MPa and the load factor for members under axial load is 3.0.



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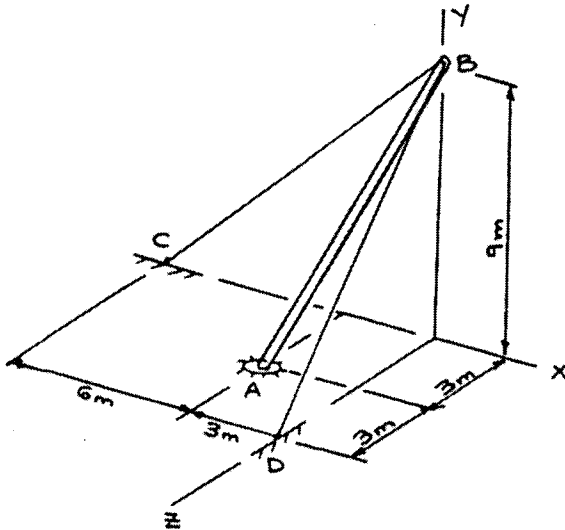
4. A 3-m wide (normal to the plane of the paper) fresh-water channel is retained at its end by a rectangular barrier, ABD , shown in section. Supporting struts BC are spaced every 0.6 m along the 3-m width. Determine the compression force in each strut.



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5. Member AB is supported by a ball-and-socket at A and by two cables connected to it at B . Determine the total weight of member AB given that the tension in cable BD is 24 kN.



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