UNIVERSITY OF TORONTO

Faculty of Applied Science and Engineering

CIV 100S – MECHANICS

Final Examination

1st May 2009

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**

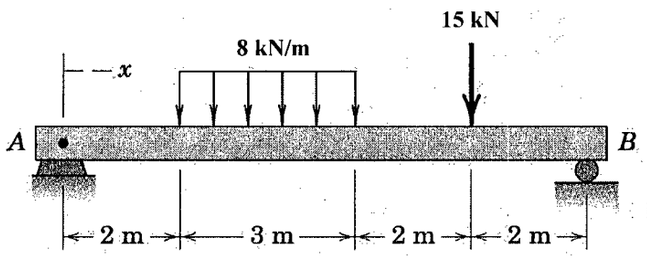
NOTES:

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.

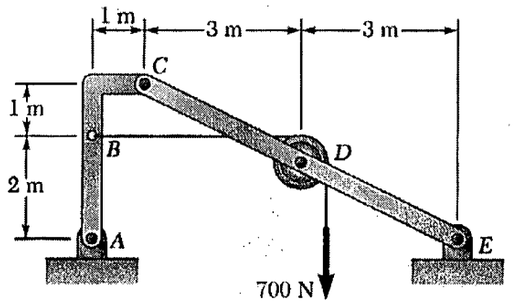
DO NOT WRITE IN THIS SPACE.

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

1. Draw the shear and bending moment diagrams for the beam loaded as shown. 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 three times its depth. The lumberyard can saw-cut timber in multiples of 5 mm only. The load factor for wood in bending is 2.0.

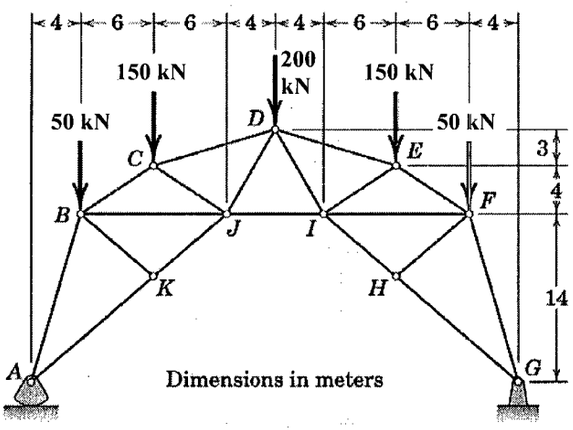


2. Knowing that the pulley has a radius of 0.5 m, determine the components of the reactions at *A* and *E* for the frame shown.

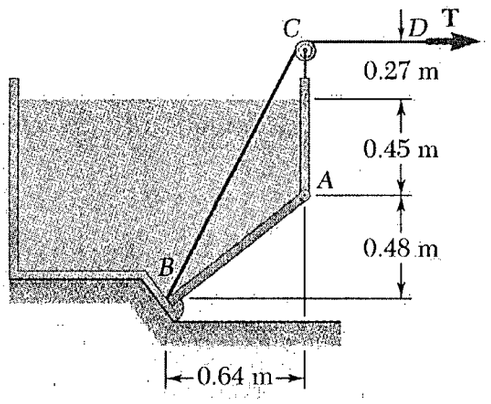


NAME: _____

3. Determine the forces in members *CD*, *JK*, *EI* and *FI* of this arched roof truss. Determine the elongation of member *EI*, if it is made of round steel bar, 22 mm in diameter. The modulus of elasticity for steel is 200,000 MPa.



4. A 0.5 x 0.8 m gate *AB* is located at the bottom of a tank filled with fresh water. The gate is hinged along its top edge *A* and rests on a frictionless stop at *B*. Determine the tension force required in cable *BCD* to open the gate.



5. The bent rod *ABDE* is supported by ball-and-socket joints at *A* and *E*, and by the cable *DF*. Determine the tension in the cable assuming the weight of the rod can be neglected.