UNIVERSITY OF TORONTO
Faculty of Applied Science and Engineering

FINAL EXAMINATION, DECEMBER 10, 2010
First Year - Programs 1,2,3,4,6,7, 8 and 9

CIV 100F - MECHANICS
Examiner: Staff in Civil Engineering

FAMILY NAME: _____ **GIVEN NAMES:** _____

(Please **print clearly**)

STUDENT NUMBER: _____

CIRCLE THE NAME OF YOUR LECTURER AND YOUR GROUP LETTER

A	**Kuhn**, Eva	D	**Zhang**, Jinyue	G	**Johnson**, David
B	**Zhang**, Jinyue	E	**El-Diraby**, Tamer	H	**Seica**, Michael
C	**Grasselli**, Giovanni	F	**Kamaleddine**, Fouad	J	**Packer**, Jeff

CIRCLE MODEL NUMBER OF CALCULATOR

CASIO 260 SHARP 520 TI 30

NOTES:

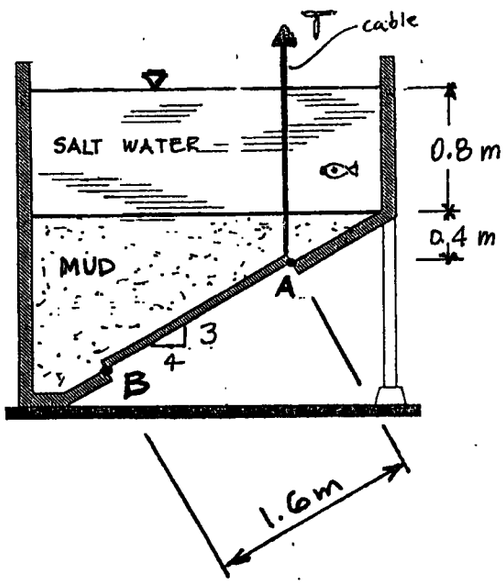
1. Be sure you have all 7 sheets of this examination paper. Page 7 is blank. If you need more space for a question please use the back of the preceding question. In all cases indicate clearly where your calculations are continued.
2. Answer all 5 (five) equal-valued questions.
3. No other paper will be accepted for marking nor allowed on the desk.
4. The permissible calculators are listed above.

DO NOT WRITE IN THIS SPACE.

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

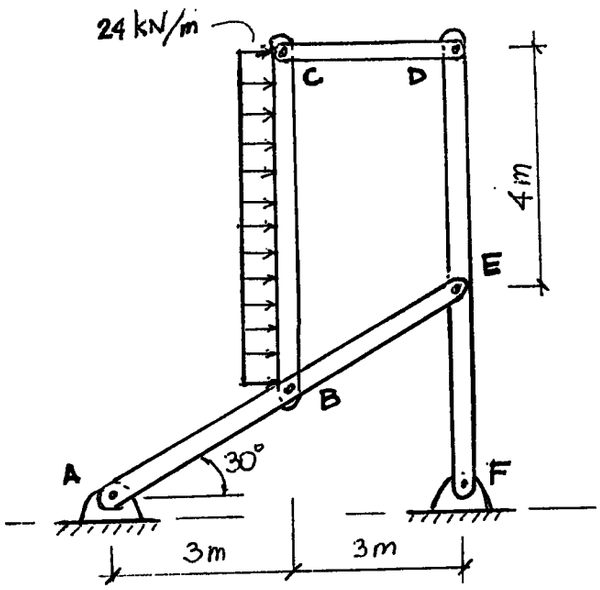
 Name _____

1. The cross section of a tank with an inclined bottom is shown below. The tank is filled with mud and water as shown. In this inclined bottom there is a uniformly thick gate (1.6 m x 2.2 m) which is hinged at B and rests at the bottom of the tank at A. The gate which has a weight of 12 kN can be opened by means of the cable at A. The density of the salt-water is 1040 kg/m^3 and of mud is 1760 kg/m^3. Determine the tension in the cable just as the gate opens. Show all forces on a separate free body diagram.



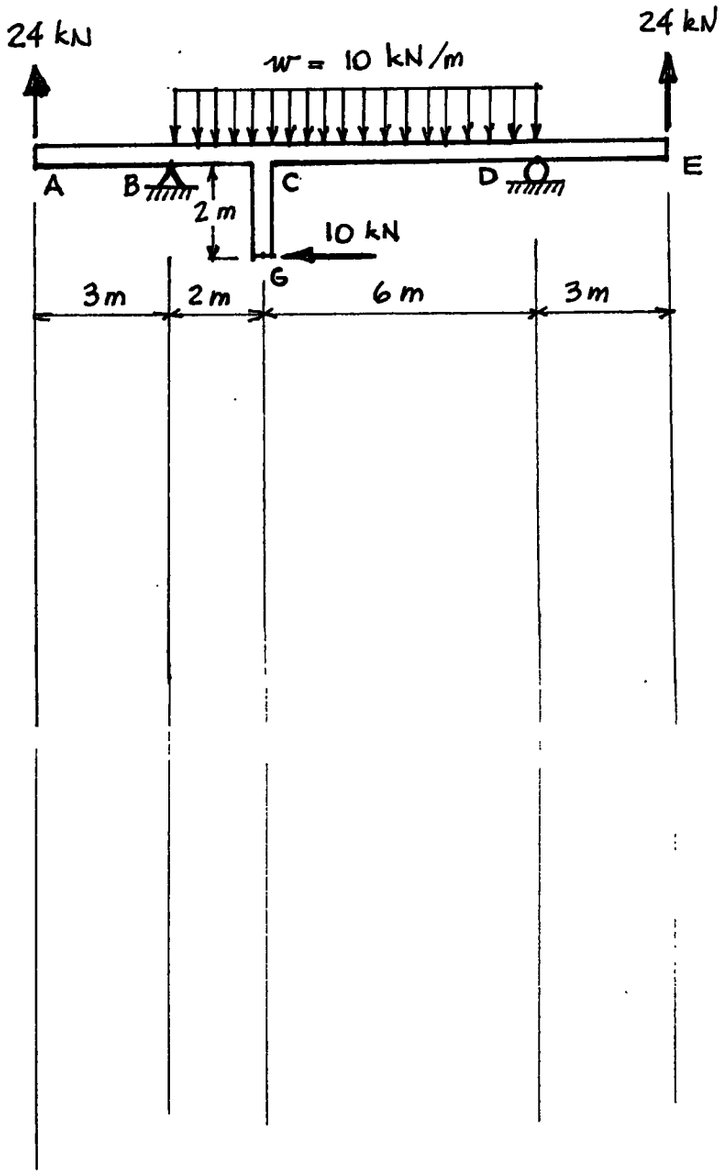
 Name _____

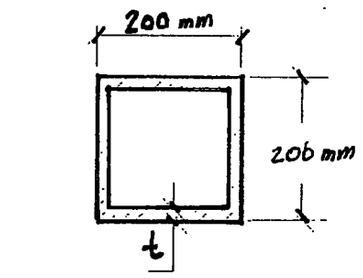
2. Given below is a pin connected and pin supported frame with loading as shown.
Determine the reaction components at supports **A** and **F** and all force components acting on member **ABE**.
Show your answers on a separate diagram of **ABE**.



 Name _____

3. The beam shown below is supported by a pin at **B** and roller at **D**. For the given loading determine:
   a) In the space provided draw the bending moment and shear force diagrams for the horizontal part of the beam.
   b) If the cross section is a hollow square as shown in the figure determine the minimum wall thickness (t) if the material is steel with the yield stress of 400 MPa in both tension and compression and with the load/safety factor of 1.6.





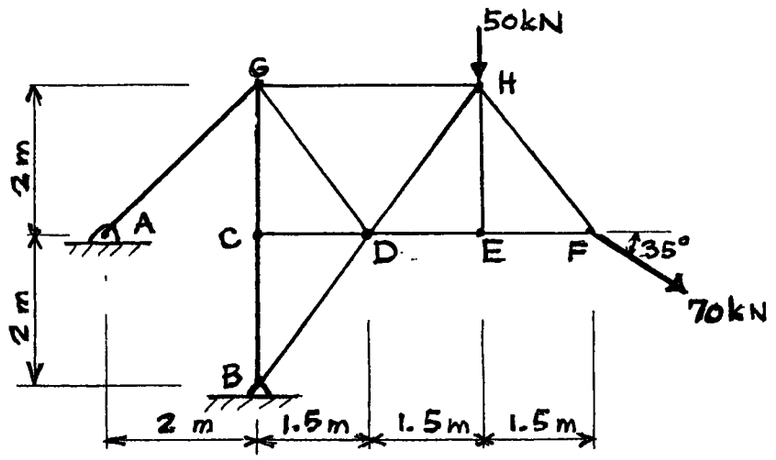
enlarged cross section

 Name _____

4. The steel truss shown is supported by a pin at **A** and a pin at **B**. The yield stress for the steel is 380 MPa, and the load/safety factor is 1.9.

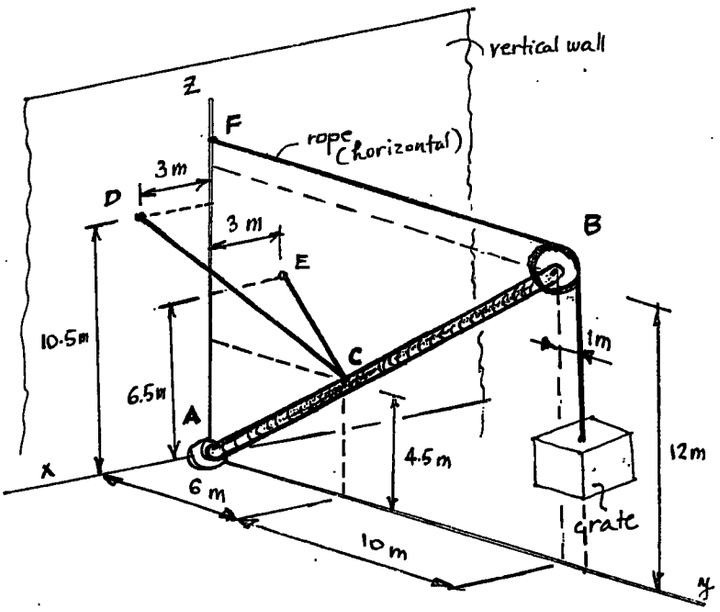
a) determine the forces in members **GH, DH** and **BC** and indicate if in tension (T) or compression (C).

b) determine the required cross section for members **GH** and **BC** assuming that they have to have the same cross–section . All cross-sections are square steel bars and the sides are available in increments of 5 mm.



 Name _____

5. The 20 m long straight, light boom **AB** is supported by ball and a socket joint at **A** and by two cables **CD** and **CE**. A 2 m diameter frictionless pulley is pinned to the boom at **B** and supports 5100 N crate. The boom is in the y-z plane and points **D, E** and **F** are in a vertical wall coinciding with the x-z plane (y = 0). The pulley and rope combination lie in the vertical y-z plane. Neglecting the weight of the boom determine the magnitude of tension in cable **CD** and **CE.**



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