UNIVERSITY OF TORONTO
Faculty of Applied Science and Engineering

FINAL EXAMINATION, DECEMBER 10, 2012
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	**El-Diraby**, Tamer	G	**Guner,** Serhan
B	**Mercan,** Oya	E	**Johnson,** David	H	**Seica**, Michael
C	**Panesar,** Daman	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.

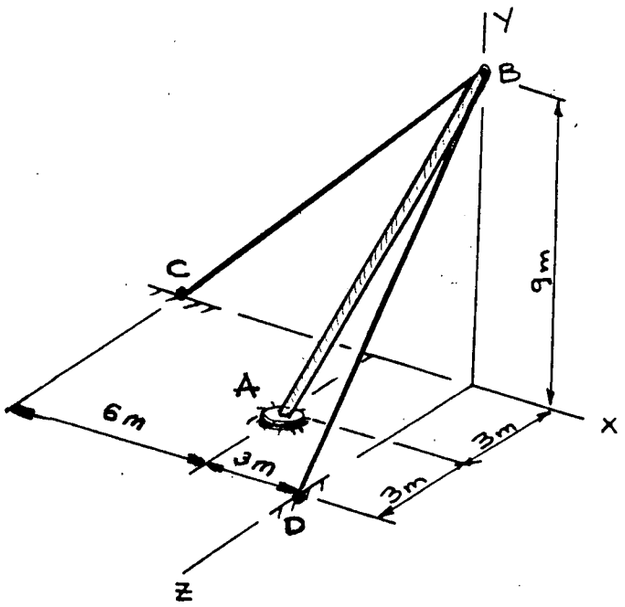
DO NOT WRITE IN THIS SPACE.

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

 Name _____

1.) Member **AB** is supported by a ball-and-socket at **A** and by two cables of negligible mass connected to it at **B**. The centre of mass for member AB is at mid-length. For the given conditions:

a) Draw a separate free-body diagram of **AB** showing all forces acting on the member.
b) If the tension in cable **BD** is known to be 24kN, determine the total weight of member **AB**.

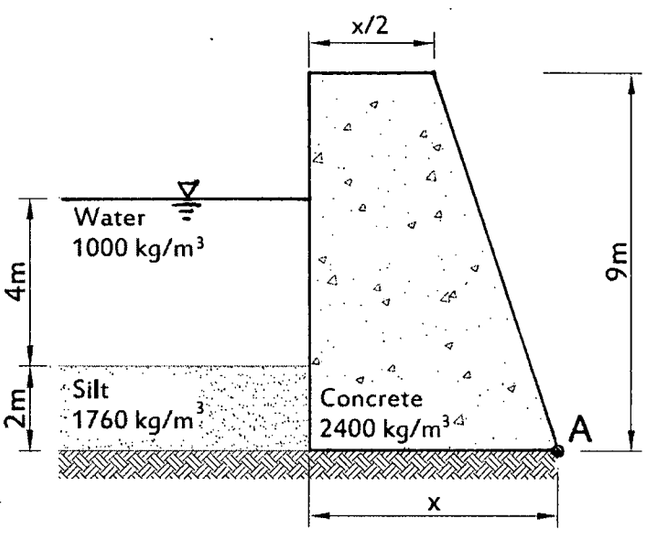


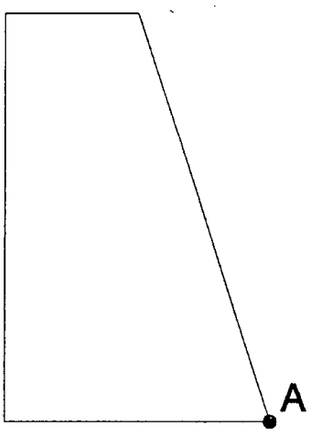
 Name _____

2.) A 9m tall gravity dam of unknown width (**x**) is shown below. The dam is used to retain fresh water and a deposited layer of silt.

a) Draw the forces acting on the dam on the blank free body diagram provided below.

b) Determine the minimum width (**x**) of the dam if the safety factor against overturning about point **A** is 1.75.



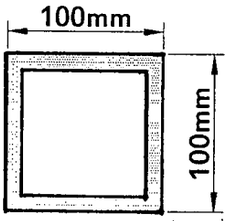


Draw Free Body Diagram Here

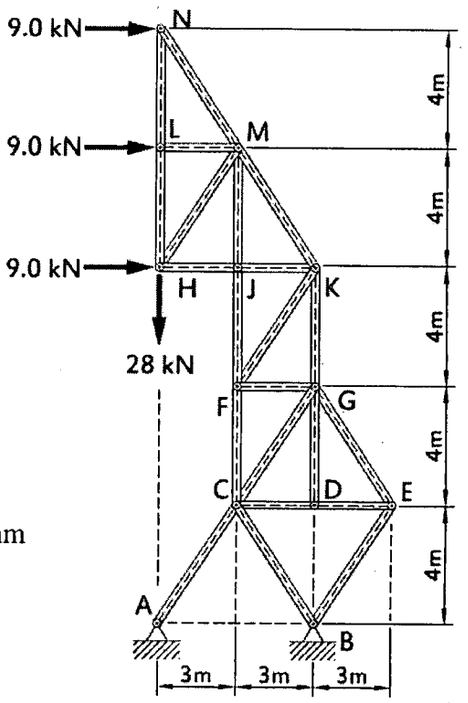
 Name _____

3. The billboard truss shown is supported by a **pin at B** and the **pin-connected member AC**. All truss members are made of steel and have the hollow square cross section shown below. You may assume all truss members have negligible mass. For the given loading determine:

a. Reaction components at **A** and **B**.
b. The forces in members **FC, GC and GE**.
c. Calculate the stresses in members **FC, GC, GE** and **AC**.
d. For **member AC,** determine the minimum required yield stress for design (σ_y). Use a load/safety factor of 2.0 for this calculation.



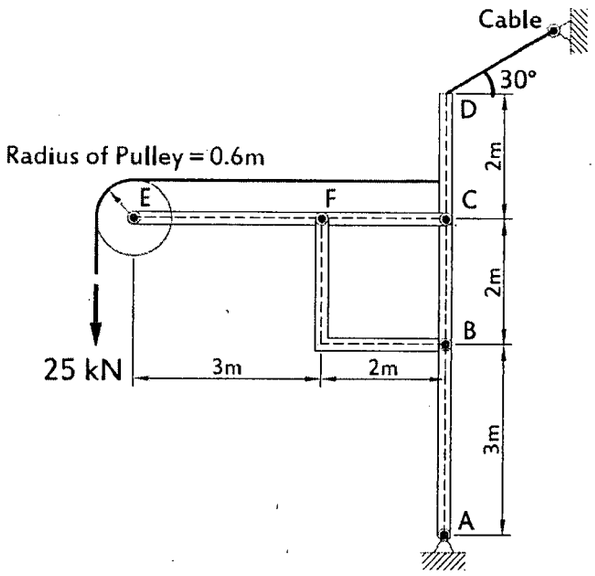
Truss Cross Section
Uniform wall thickness of 10mm



 Name _____

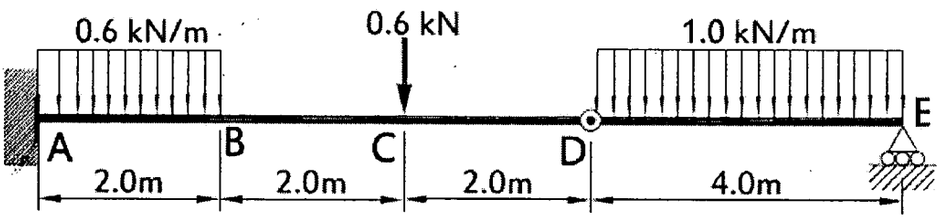
4. The pin-connected frame is comprised of three (3) members (**EFC**, **ABCD** and **BF**) and a pulley at **E**. The frame is supported by a **pin at A** and **cable at D**. You may assume the pulley, cable and all members have negligible mass. For the given loading, determine:

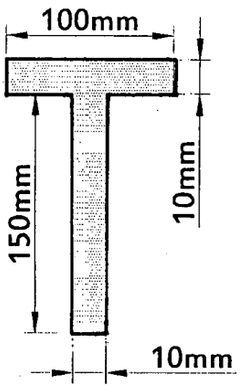
a) The reaction components at **A** and **D**.
b) The components of the forces at the pins on **member EFC**. Show your final answer on a **new free body diagram** sketch of **EFC**.



 Name _____

5. The beam shown below is supported by a **fixed connection at A** and **roller at E**, the beam is also **internally pinned at D**. For the given loading determine:
   a) The reactions at **A** and **E**.
   b) Draw neatly the shear force and bending moment diagrams in the space provided below the beam. (Locate and indicate values at supports, loads and local maxima and minima)
   c) If the yield stress for the material in the beam is **400 MPa** and the load/safety factor is **1.5,** for the given cross-section below, determine if this beam is safe.





Cross Section