

**UNIVERSITY OF TORONTO
Faculty of Applied Science and Engineering**

**FINAL EXAMINATION, DECEMBER 11, 2013
First Year - Programs 1, 2, 3, 4, 5, 6, 7, and 8**

**CIV100 - Mechanics
Examiner: Staff in Civil Engineering**

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

STUDENT NUMBER: _____

CIRCLE THE NAME OF YOUR LECTURER AND YOUR SECTION NUMBER

- | | |
|------------------------|------------------------|
| 1. Grasselli, Giovanni | 5. Packer, Jeffrey |
| 2. Mercan, Oya | 6. Kamaleddine, Fouad |
| 3. Panesar, Daman | 7. Grasselli, Giovanni |
| 4. El-Diraby, Tamer | 8. Seica, Michael |

CIRCLE MODEL NUMBER OF CALCULATOR

Casio FX991

Sharp EL520

NOTES:

1. Be sure you have all 7 sheets of the 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

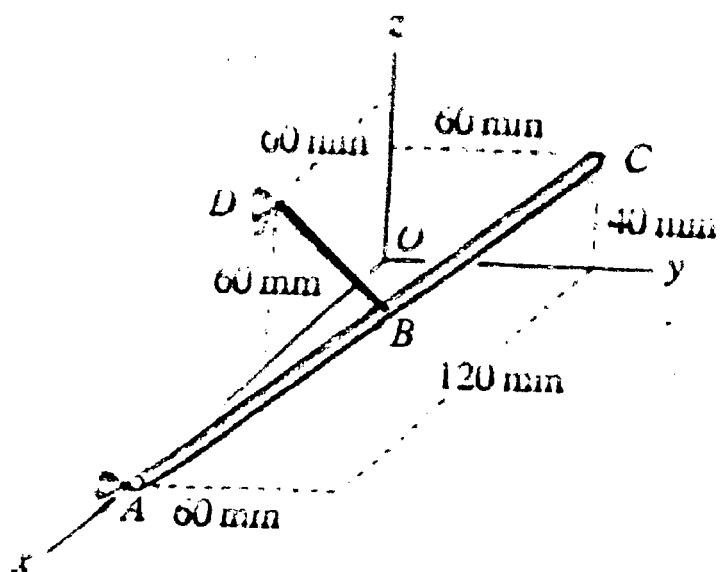
1.	/12
2.	/12
3.	/12
4.	/12
5.	/12
TOTAL	/60

Question 1

The bar AC (point C is in the y-z plane) is supported by a ball and a socket at A and a cable BD (point D is in the x-z plane; point B is in the middle of the bar). The bar is resting on a smooth surface at C.

The weight of the bar is 250 kN.

- Find the tension in the cable.
- Find the reaction components at A.
- Find the reaction components at C.



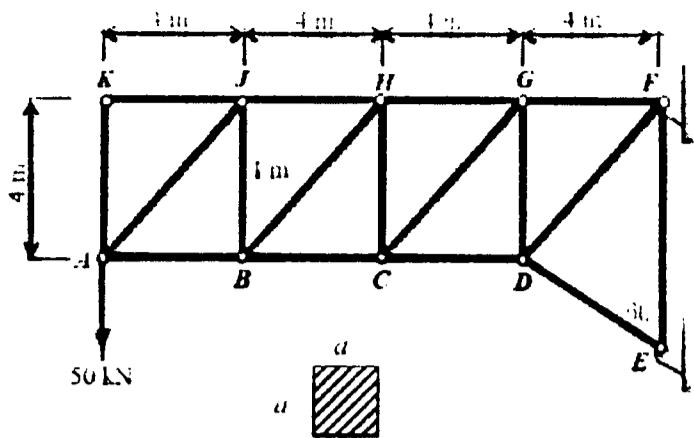
Requirements	Your NEAT Final Answer
Tension in the cable	
Reaction components at A	
Reaction components at C	

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Question 2

For the truss shown.

- Find the forces in members HG, CG and AJ.
- Members are made of solid cross sections as shown. The material used can handle a stress of 24 MPa. A load (safety) factor of 1.2 is applied. Find the minimum dimensions (value of a) for member AJ.



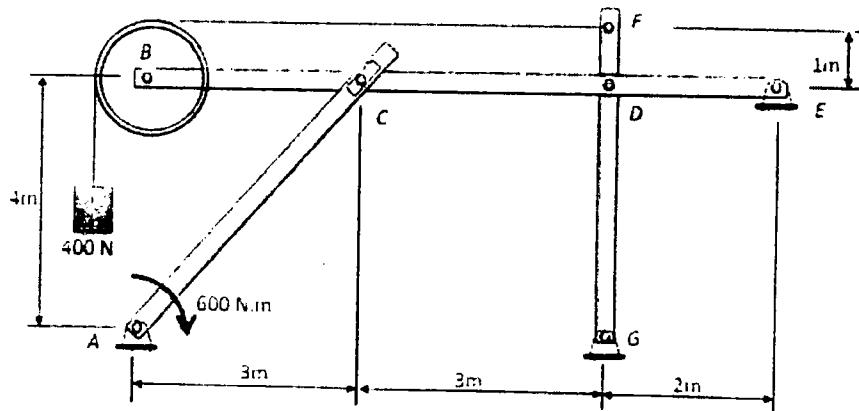
Requirements	Your NEAT Final Answer
Force in member HG	
Force in member CG	
Force in member AJ	
Value of a	

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Question 3

In the frame shown, member BE is connected to member AC through a smooth slot at C. The structure is subject to an applied couple of 600 N.m at A. The pulley at B supports a load of 400 N.

Find & Draw all the force components acting on member BE in the box below.



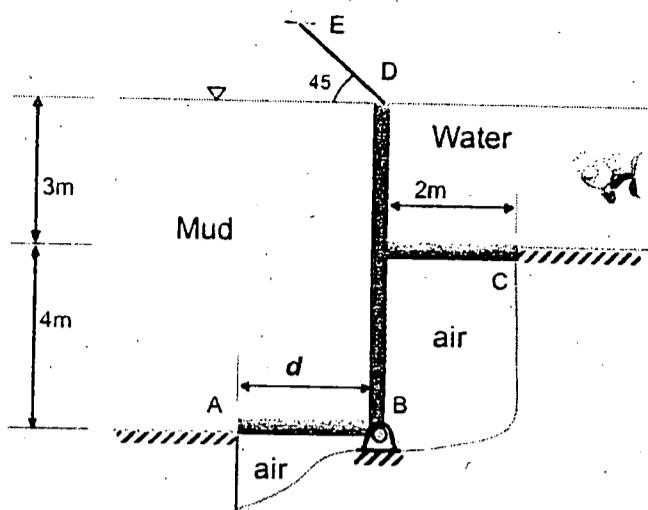
Requirements	Your NEAT Final Answer
	<input type="text"/>

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Question 4

The structure ABCD is separating mud from water as shown. It is supported by a pin (hinge) at B and a cable at D. Cables are spaced at 2 m (into the paper). The tension in each cable is 100 kN. The density of water is 1000 Kg/m³. The density of mud is 1300 Kg/m³.

What is the minimum distance d needed to maintain equilibrium?



Requirements	Your NEAT Final Answer
Minimum distance d	

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Question 5:

The beam below is supporting the loads shown.

- Draw the Shear Force Diagram and the Bending Moment Diagram. Show all key values.
- The cross section shown will be used. If the material has a very weak tensile capacity compared to its compressive capacity, what is the best orientation of the section (A or B)?
- What is the tensile stress in this case, if a load (safety) factor of 1.2 is applied.

Requirements	Your NEAT Final Answer	
Circle one position only	A	B
Maximum tensile stress		

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