# CIV100-Mechanics: Final Exam 2013

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.
a. Find the tension in the cable.
b. Find the reaction components at A.
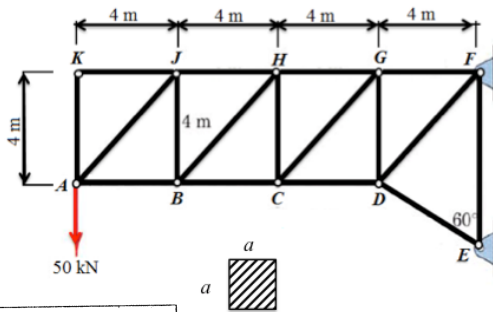c. Find the reaction components at C.

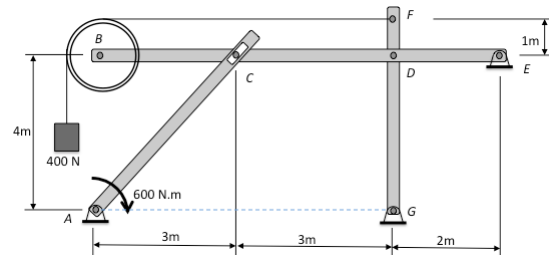| Requirements	Your NEAT Final Answer
Tension in the cable	
Reaction components at A	
Reaction components at C	
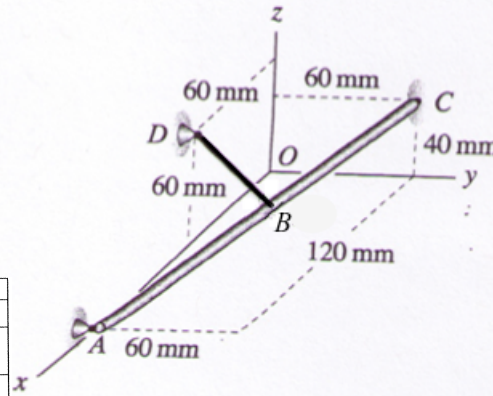
Question 2
For the truss shown.
a. Find the forces in members HG, CG and AJ.
b. Members are made of solid cross sections as shown. The material used can handle a stress of 24 MPa. A load (safety) factor of 1.2 is applied. Find the minimum dimensions (value of a) for member AJ.

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.

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

Question 3 The pulley at B supports a load
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.
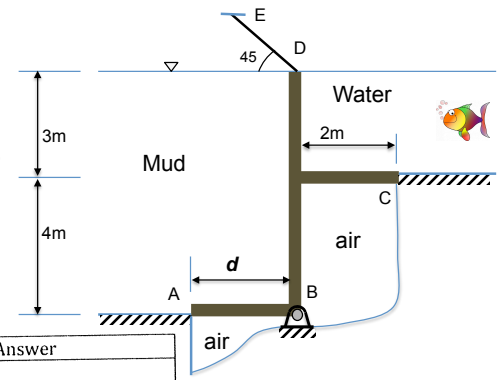Find & Draw all the force components acting on member BE in the box below.

Requirements	Your NEAT Final Answer

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?

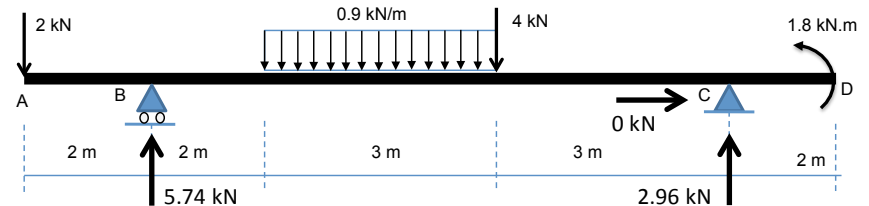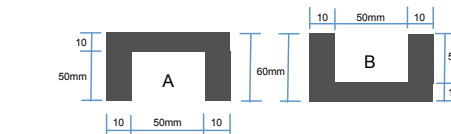| Requirements	Your NEAT Final Answer
Minimum distance d	

Question 5
The beam below is supporting the loads shown.
a. Draw the Shear Force Diagram and the Bending Moment Diagram. Show all key values.
b. 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)?
c. 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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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.

a. Find the tension in the cable.

b. Find the reaction components at A.
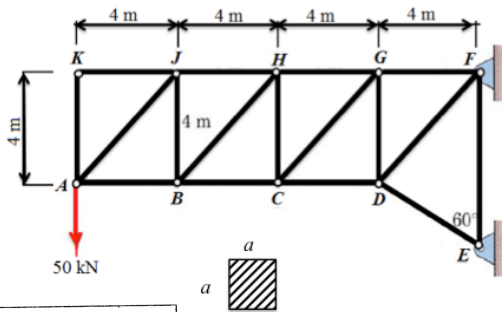
c. Find the reaction components at C.

Requirements	Your NEAT Final Answer
Tension in the cable	208 kN
Reaction <u>components</u> at A	$A_x = -125.0$ kN $A_y = 125.0$ kN $A_z = 83.3$ kN
Reaction <u>components</u> at C	$C_x = 125.0$ kN $C_y = 0$ $C_z = 0$
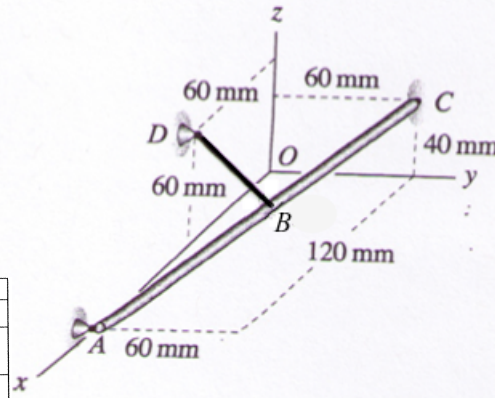
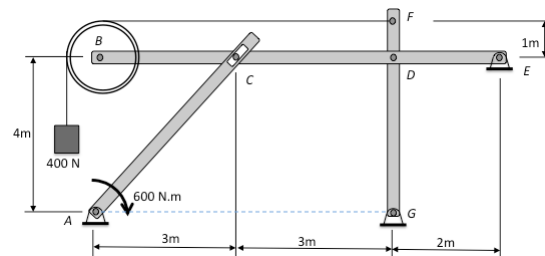## Question 2

For the truss shown.

a. Find the forces in members HG, CG and AJ.

b. 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.

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
Force in member HG	100.0
Force in member CG	70.7
Force in member AJ	70.7
Value of *a*	59.5

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		
	B	C 96.0 N	500 N D	E 4.00 N	
400 N	400 N	72.0 N	1780 N	1308 N	

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*	2.68m
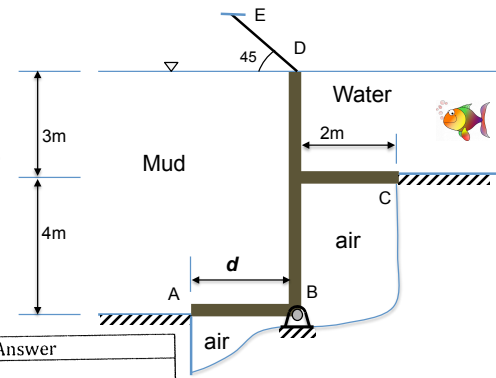
Question 5

The beam below is supporting the loads shown.

a. Draw the Shear Force Diagram and the Bending Moment Diagram. Show all key values.

b. 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)?

c. 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	496 MPa

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