Uganda Martyrs University

Faculty of the Built Environment

ENDS – 1241 design and Construction Technology

15th July 2022

Special Exam

Instructions:

Personal practice is key to success at all Levels of Design and Construction Technologies

Answer ALL questions.

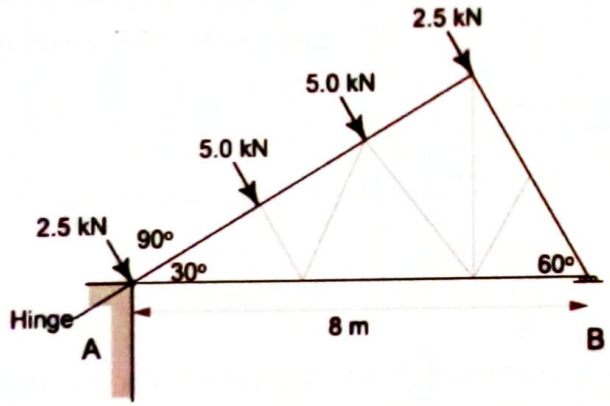
a. Read the whole question before you set out to answer part of it.

b. It is COMPULSARY to draw Free Body Diagrams and state reference points for each equation.

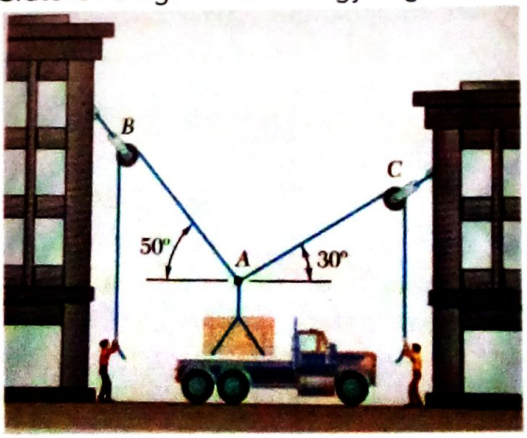
c. SHOW your thought process with necessary annotation, explanation or comment.

d. Take the time to notice/ identify how different topics are questioned

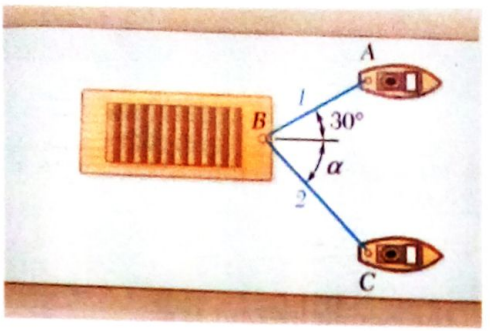
1. The roof truss is supported on rollers at B and the reaction at B is therefore vertical. Determine the resultant of the four winds loads, then use the triangle of forces to determine the reactions at A and B. [10 mks]

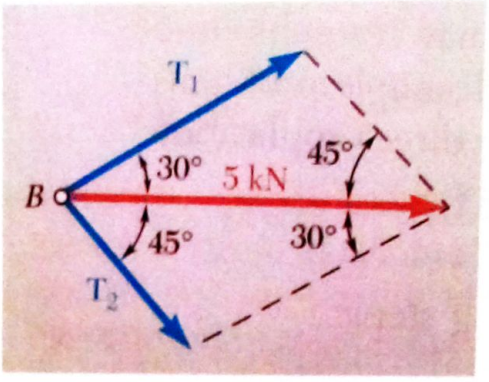


2. How much force should Peter and Morris apply to hoist this crate onto a truck? Crate is 75 Kg. What strategy might either man employ to carry less load? [10 mks]



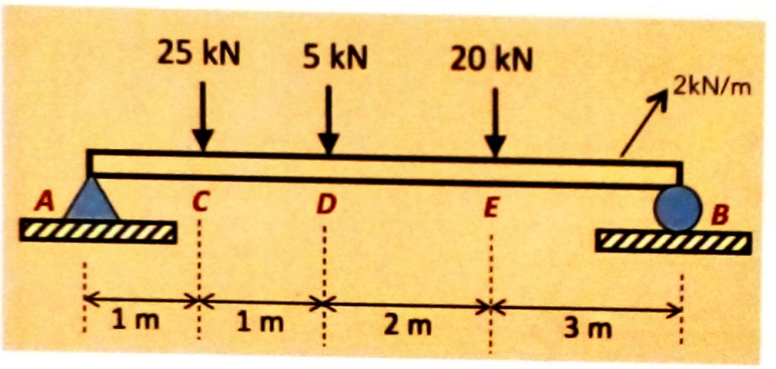
3. A Barge is pulled by tugboats. Calculate the tension is each of the ropes T1 and T2 if the diagonal is known to be 5kN. [10 mks]





4. Three loads are applied on a beam as shown, which experiences a dead load of 2kN/m. The beam is supported by a pin at A and a roller by at B. Neglect the weight of the beam, determine the reaction at A and B. Then draw a Shear Force Diagram and a Bending Moment Diagram to represent the system.

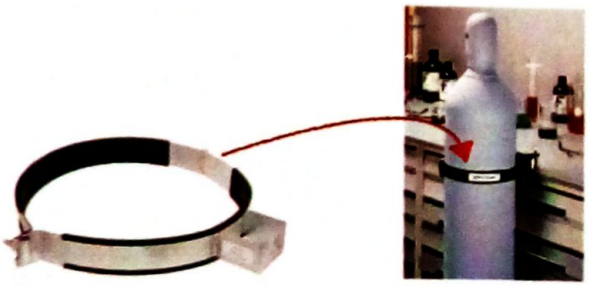
[30 mks]



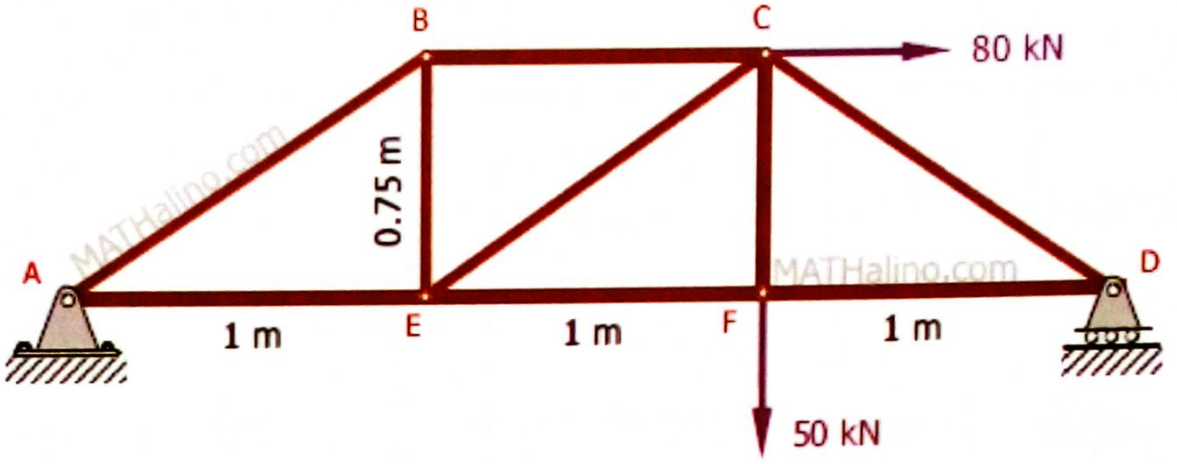
5. You have to choose one of two given Straps systems to hold up a gas cylinder, the strap material can only hold up to 5.3kN/m^2 . A canister weights 0.4 kN and has a diameter of 140mm.
   - the ***single** is a 75mm wide strap that costs 18,000 UGX
   - the ***THREE** of 30mm wide straps each costing 5,000UGX

PS: ONLY **75%** of the strap can be in contact with the Cylinder. *(your calculation should resolve this matter)*

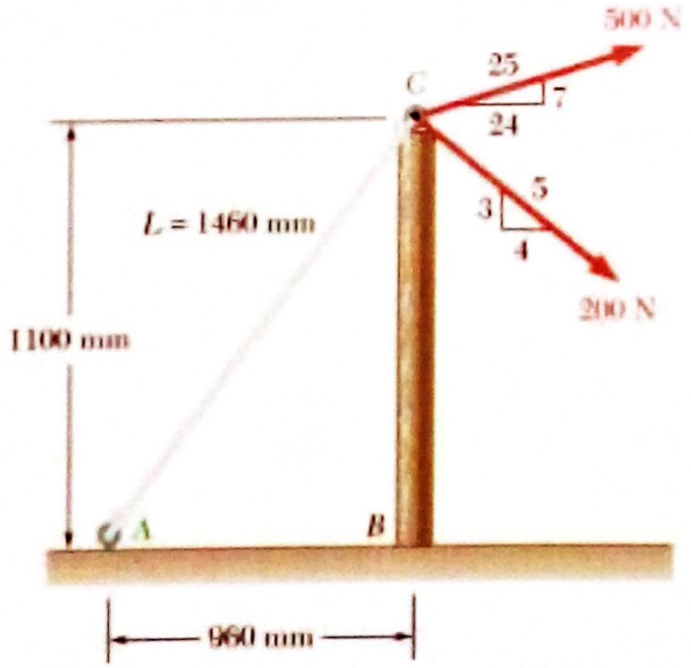
[10 mks]



6. Given the truss below. Calculate the reaction at A and D ?
Then calculate the forces in the members EF, EC and BC ?
[20 Marks]



7. For the post loaded as shown, determine (*a*) the required tension in rope *AC* if the resultant of the three forces exerted at point *C* is to be horizontal, (*b*) the corresponding magnitude of the resultant. [10 Marks]



L top to Bottom
1460 mm
1100 mm
960 mm

top triangle b = 24, h = 7, hyp = 25
bottom triangle b = 4, h = 3, hyp = 5

LOADs
500 N
200 N