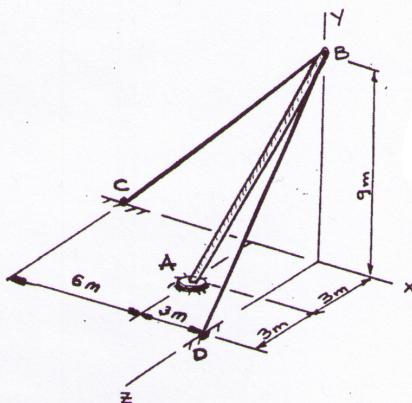


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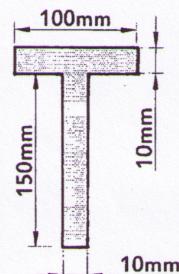
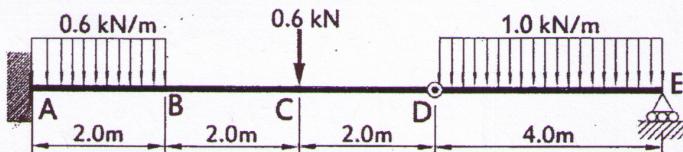
- 1.) Member AB is supported by a ball-and-socket at A and by two cables of negligible mass connected to it at B. The centre of mass for member AB is at mid-length. For the given conditions:

- 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.



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:

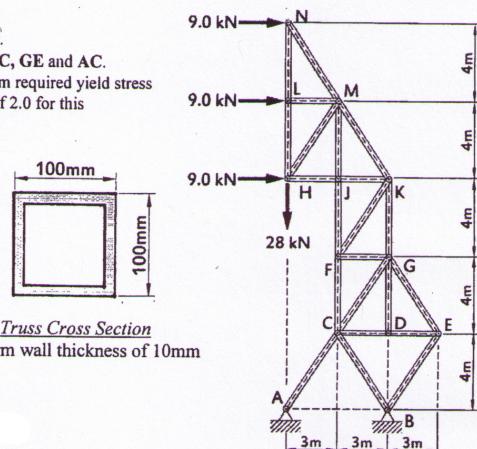
- a) The reactions at A and E.
b) Draw neatly the shear force and bending moment diagrams in the space provided below the beam.
(Locate and indicate values at supports, loads and local maxima and minima)
c) If the yield stress for the material in the beam is 400 MPa and the load/safety factor is 1.5, for the given cross-section below, determine if this beam is safe.



Cross Section

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:

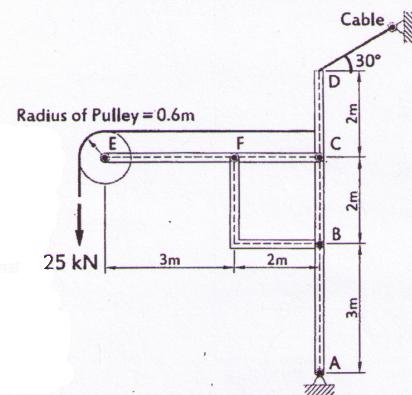
- a. Reaction components at A and B.
b. The forces in members FC, GC and GE.
c. Calculate the stresses in members FC, GC, GE and AC.
d. For member AC, determine the minimum required yield stress for design (σ_y). Use a load/safety factor of 2.0 for this calculation.



Truss Cross Section
Uniform wall thickness of 10mm

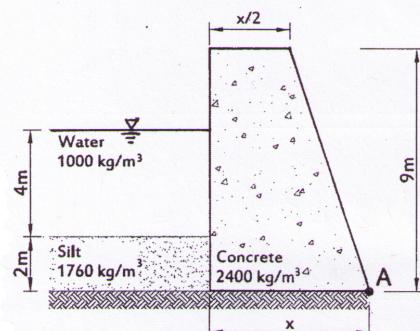
4. The pin-connected frame is comprised of three (3) members (EFC, ABCD and BF) and a pulley at E. The frame is supported by a **pin at A** and **cable at D**. You may assume the pulley, cable and all members have negligible mass. For the given loading, determine:

- 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.



- 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.

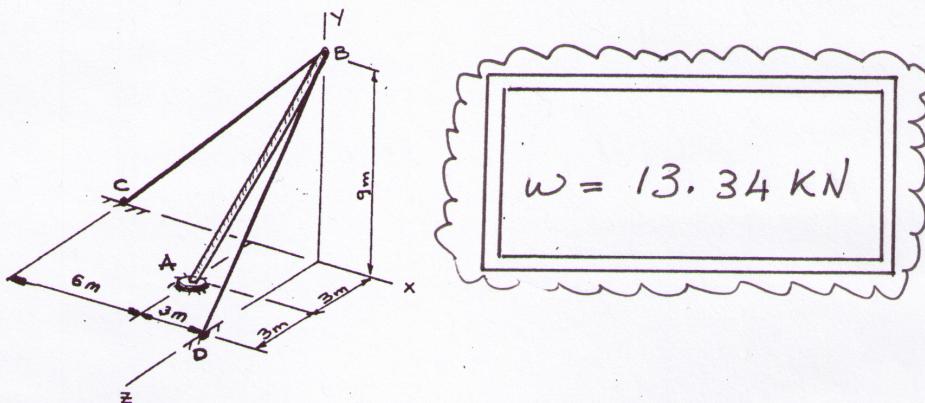
- a) Draw the forces acting on the dam on the blank free body diagram provided below.
b) Determine the minimum width (x) of the dam if the safety factor against overturning about point A is 1.75.



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- 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.



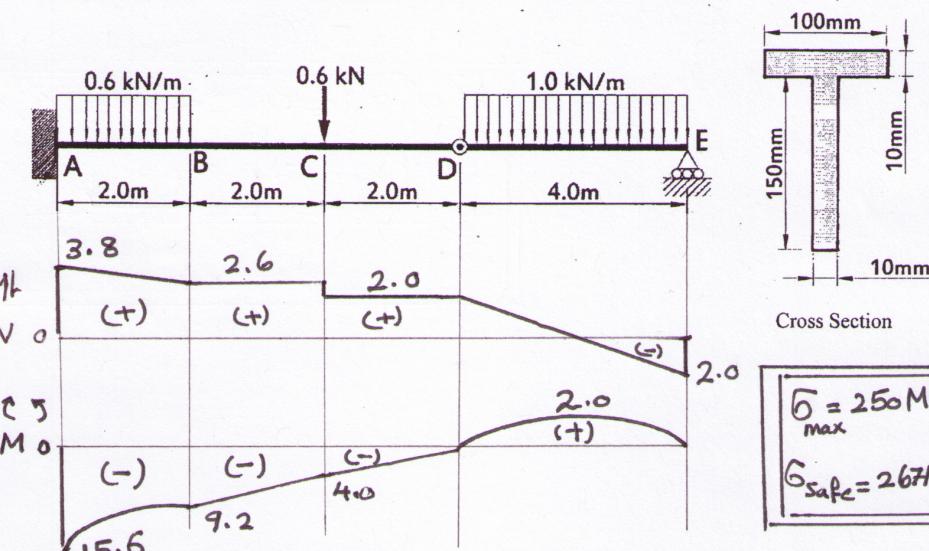
5. The beam shown below is supported by a fixed connection at A and roller at E, the beam is also internally pinned at D. For the given loading determine:

- 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)

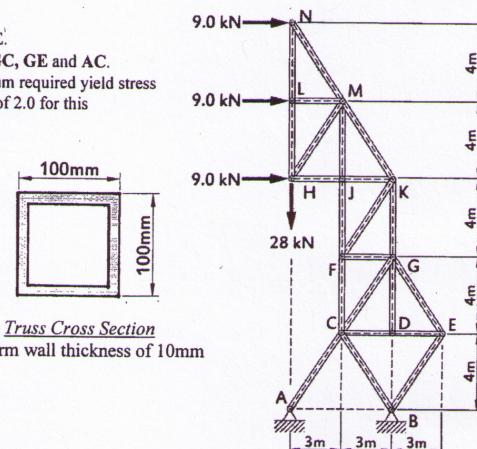
- c) If the yield stress for the material in the beam is 400 MPa and the load/safety factor is 1.5, for the given cross-section below, determine if this beam is safe.



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:

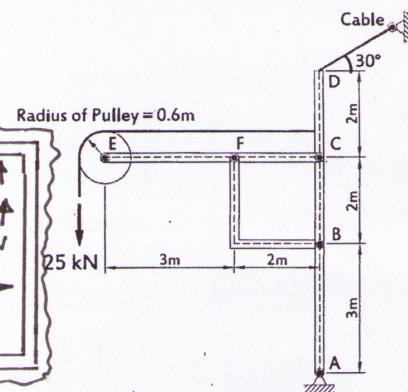
- a. Reaction components at A and B.
b. The forces in members FC, GC and GE.
c. Calculate the stresses in members FC, GC, GE and AC.
d. For member AC, determine the minimum required yield stress for design (σ_y). Use a load/safety factor of 2.0 for this calculation.

Force $CF = 16(T)$ $CG = 5(C)$ $GE = 50(C)$ $R_{AX} = 33 \leftarrow R_{AY} = 44 \downarrow$ $R_{BX} = 6 \rightarrow R_{BY} = 72 \uparrow$ $\sigma_{AC} = 15.33 \text{ MPa}$ $\sigma_y(\text{AC}) = 30.66 \text{ MPa}$	σ 4.44 MPa 1.389 MPa 13.89 MPa $R_{AX} = 33 \leftarrow R_{AY} = 44 \downarrow$ $R_{BX} = 6 \rightarrow R_{BY} = 72 \uparrow$ $\sigma_{AC} = 15.33 \text{ MPa}$ $\sigma_y(\text{AC}) = 30.66 \text{ MPa}$
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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.



- 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.

$x = 2.55 \text{ m}$

