



CIVL2201 Structural Mechanics

Assignment 1 – Internal Actions

This assignment is to be submitted by 2 pm Thursday 2 April 2009 to your tutor at the beginning of the tutorial session. Assignments received after 2 pm will be noted as late, and may lose marks. Please submit stapled sheets without any manilla folders or slip in sheet protectors etc.

This assignment is worth 5 % of the total mark.

Please attach the “Assignment Cover Sheet”, available from the Structural Mechanics website, as the first page of the submission.

- 1) Consider a horizontal cantilever beam of length 10 m. The free tip of the cantilever is at the right hand end. There is a uniformly distributed load of magnitude 2 N/mm acting vertically downwards from 0 m to 6 m along the length of the beam (measured from the left). There are also two point loads, vertically down, each of magnitude 4 kN, acting at the midpoint of the beam and at the free tip. The effects of self-weight are negligible compared to effects of the applied loading. Draw the bending moment diagram (BMD) and shear force diagram (SFD).
- 2) The attached sheet shows a set of engineering calculations that were used in the design of a beam. Your company has been requested to review the calculations and to report to Professor John Smith at The School of Civil Engineering at The University of Sydney on the correctness of the analysis. Professor Smith’s email is profjonathonsmith@gmail.com.
 - Prof Smith does not accept attachments of any kind and the email must be readable as plain text.
 - Your email to Prof Smith should be as brief as possible, should identify whether or not the calculations are correct, and if they are incorrect, should try to identify where the mistake(s) was made, and, if possible, give the correct answer.
 - An appropriate level of professionalism is expected in your email to Prof Smith.
 - **Students should send an email to Prof Smith and include a printed copy of the email in their assignment.**
 - Prof Smith is very pedantic, and students should first configure their email to show their name as the sender correctly using the instructions at <http://www.civil.usyd.edu.au/current/undergraduate/email.shtml>.
 - Note that if you send Prof Smith more than one email he will only look at the first one received.
 - **Students should first send a test email to themselves or a friend to ensure that all the conditions are met**

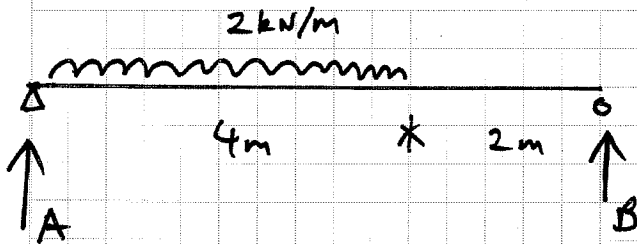
Academic honesty:

- Students are always encouraged to help each other with studying, however copying solutions from anyone, where you have little or no academic input is not acceptable.
- Any form of copying and pasting electronic data for question 2 is not acceptable. The lecturer will have electronic copies of all submissions, so it will be very easy to detect copying.

Tim Wilkinson

Tim Wilkinson

Senior Lecturer in Civil Engineering



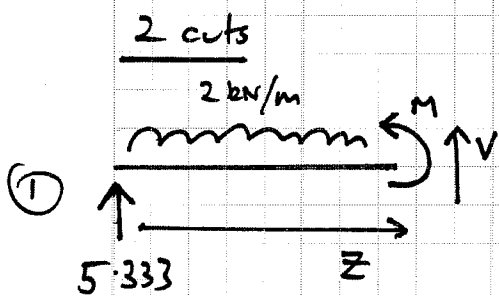
FBD & reactions

$$\sum F_x = 0 \quad (\text{nothing horiz})$$

$$\sum M_B = 0 ; 6A - 4 \times 2 \times 4 = 0$$

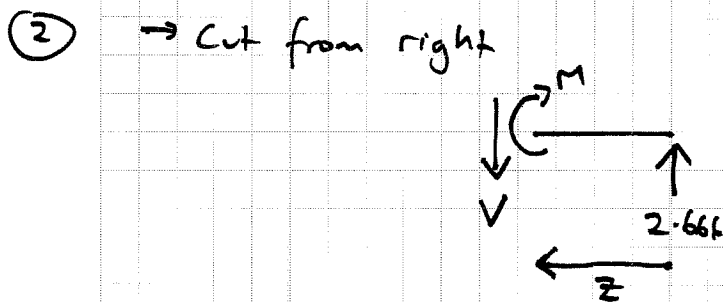
$$\Rightarrow A = 5.333 \text{ kN.}$$

$$\sum F_y = 0 \quad \Rightarrow \quad B = 2.666 \text{ kN.}$$



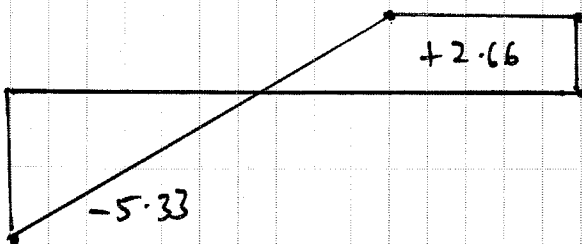
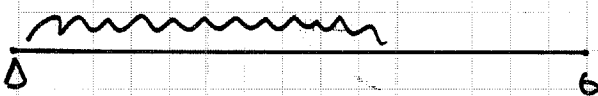
$$\sum F_y = 0 \quad \Rightarrow \quad V = 2z - 5.333$$

$$\sum M_{cut} = 0 \quad M = 5.333z - 2z^2$$

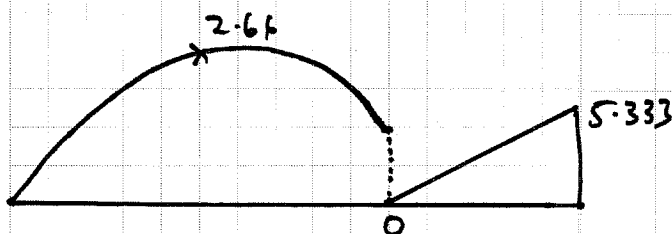


$$\sum F_y = 0 \quad \Rightarrow \quad V = 2.666 \text{ kN.}$$

$$\sum M_{cut} = 0 \quad M = 2.666z$$



SFD (kN)



BMD (kNm)