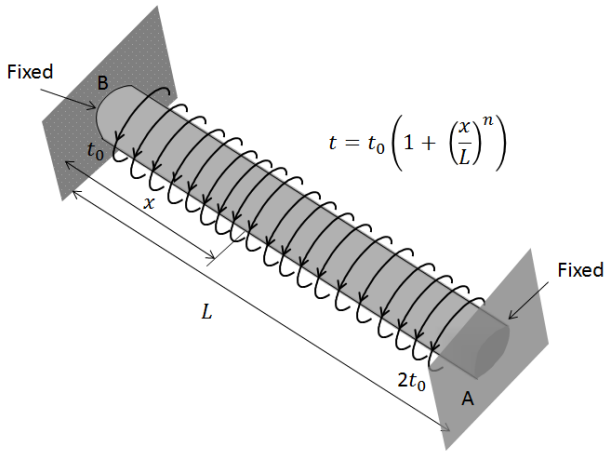
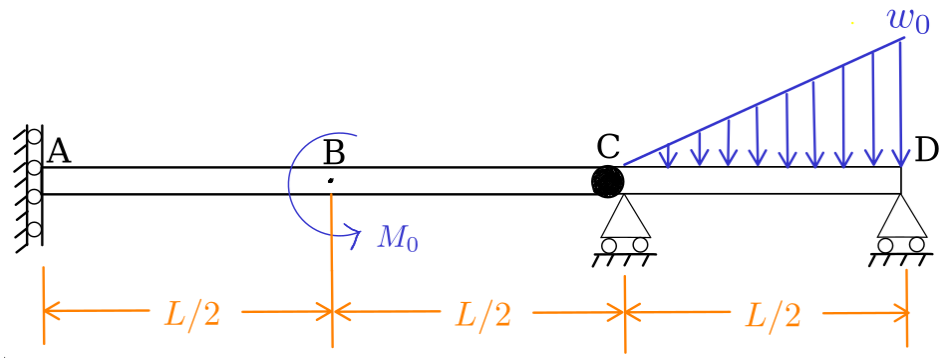
Assignment Sheet 1

The assignment submission rules are on the last page. Read them very CAREFULLY!

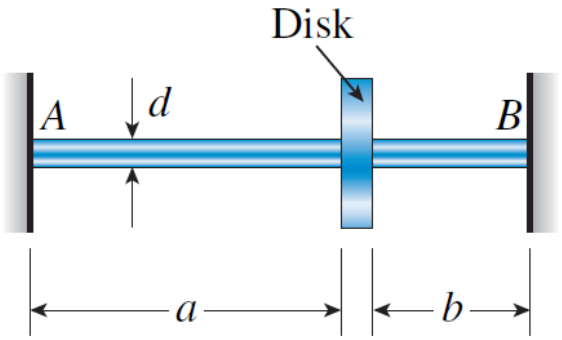
1. The shaft shown in the figure is subjected to a distributed torque, $t = t_0\left(1 + \left(\frac{x}{L}\right)^n\right)$, where $n \geq 2$ is a positive integer. The two ends of the shaft are fixed to walls. Determine the reactions at the ends A and B. **[10 marks]**



2. The compound beam made of the beams AC and CD are simply supported at C and D. The support at A allows free sliding along the vertical guide. Beams AC and CD are joined by a hinge just to the left of the simple support at C. Draw the shear force and bending moment diagrams of the entire compound beam. Take $w_0 = \frac{P}{L}$ and $M_0 = PL$. In your diagrams, clearly label all critical values of the shear force and bending moment and also the locations where they are zero. **[8 marks]**



3. A solid circular shaft AB of diameter d is fixed against rotation at both ends (see figure). A rigid circular disk is attached to the shaft at the location shown. What is the largest per missible angle of rotation $\phi_{\max}$ of the disk if the allowable shear stress in the shaft is τ_{allow}? (Assume $a > b$.) **[8 marks]**



Very Important:

- Assignment submissions must be done *strictly* according to the deadline of 11:55 PM on Sep. 10 (Friday) in MS Teams.
- Make sure that you **"turn in"** in your assignment after uploading in MS Teams.
- A deadline of 11:55 PM does **NOT** mean that you start uploading your submission document at 11:55 PM. It means that your document should have finished uploading by 11:55 PM. Therefore, you need to *start uploading before* 11:55 PM, allowing for some time for the upload to take place. It is always advisable to start the uploading about half an hour earlier to account for some technical snag.
- You are allowed to discuss; search the internet; refer to any book; or access any other resource to help you in attempting the assignment.
- You are **NOT ALLOWED** to copy the solution from your batchmates. Copying can be easily detected and will be severely punished. **Cases of copying will be summarily given zero marks.**
- Even if it is clear who copied from whom, all students involved in the copying will be equally penalized with zero marks.
- The assignment submission must be made in a neat and clean fashion. The solutions must follow the sequence of the question numbers.
- The solution steps must be clearly explained. Just writing some formulae and presenting an answer after a messy derivation/working out will be **severely penalised**.
- *It is* **not** *the responsibility of the grader to extract meaning out of the student's work. It is the responsibility of the student to present everything clearly.* Clear communication of one's ideas is an essential part of training to be an engineer.
- The assignment submission **MUST** be made as **a single PDF file**. No other format will be accepted.
- The single PDF file can contain multiple pages. The pages **MUST** be in the proper sequence. Any discrepancy in the sequence will lead to the answer not being evaluated, leading to zero marks for that question.
- No page(s) of the single PDF file should be rotated. Again, incorrect orientation of any page will lead to the answer not being evaluated, leading to zero marks.
- Name your file **strictly** in the form '`YourRollNo_AS1.pdf`'. For instance: '`20ME10001_AS1.pdf`'. An incorrectly named file may result in the submission not being evaluated.