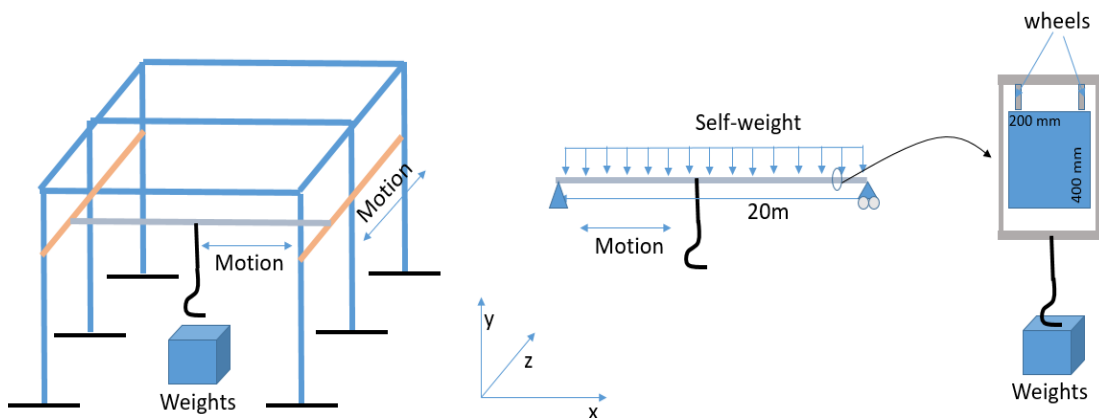


CIL2030 Course project

Submission (Group project presentations on 1-5-2023)

Task: Form into a group of 4 members and develop a presentation (6 min presentation & 4 min Viva) on the following questions.

- 1) Briefly explain the failure theories, specifically a) Maximum normal stress theory and b) Tresca/maximum shear stress theory (4 m). Hint: Go through the reference books and other standard sources.
- 2) The storage house shown below facilitates the storage of various packed shipments. It can accommodate shipments of different sizes with a maximum permissible weight of an individual shipment as 20 kN. A Gantry mechanism has been proposed for efficient lifting and placing of shipments. The beam, which is grey, traverses in the z-direction and the hook attached to it traverses along the x-direction. In the context of the present problem, assume vertical static loading of the weights.



However, ready-made beams are not available in the vicinity of the storage house. The beam (grey colour) needs to be fabricated with the help of sheet form of materials available in the local workshop. The general material catalogue of the local workshop is shown in Annexure-1, and the thickness of each material sheet is fixed to be 40 mm, which implies that the beam will be composed of 10 material sheets of dimensions (20×0.2×0.04m). Given the constraints, execute the following tasks (6m).

- a) Develop a tool (excel/programming) that takes the material sheets and their location (placement/layer orientation) as input and computes each layer's bending stress distribution. The aforementioned computations have to be performed for critical zones of bending moment. In the case of bending stress, check whether the stresses are within the yield stress limits (4 m).
Note: The toolkit has to be verified with results of homogenous orientation (same material sheets for all ten layers)
- b) optimization strategies with supporting calculations (2m)

Important Notes:

- 1) **two groups can have five members to accommodate the overall class strength of 38 students.**
- 2) **CR has to mail the group details to the instructor by 5-4-2023.**
- 3) Before beginning the presentation, the groups have to include a slide declaring the individual member contributions.
- 4) By default, the same marks will be given to all group members. In case of additional/non-uniform contributions, the marks will be allocated accordingly as per the declaration provided by the members.
- 5) The CR can facilitate interim doubt clarification sessions (max two).

Annexure-1

Material details from the nearest workshop

Material-ID	Elastic modulus (GPa)	Yield strength (MPa)	Density (kg/m ³)	Price (INR/m ² of sheet)
1	27	5	500	50
2	29	6	520	55
3	31	6	550	60
4	33	7	400	65
5	35	7	650	70
6	37	8	660	75
7	39	8	670	80
8	41	9	680	85
9	43	9	690	90
10	45	10	686	95
11	47	10	682	100
12	49	11	678	105
13	51	11	674	110
14	53	12	670	115
15	55	12	666	120
16	57	13	662	125
17	59	13	658	130
18	61	14	654	135
19	63	14	647	140
20	65	15	640	145
21	67	15	633	150
22	69	16	626	155
23	71	16	619	160
24	73	17	612	165
25	75	17	605	170
26	77	18	598	175
27	79	18	591	180
28	81	19	584	185
29	83	19	577	190
30	85	20	570	195