Laboratory course - MATLAB Report (Group – 7)

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What are the main components of an optimization problem?

The main components of optimization problem are:

Objective function: Function that needs to be optimized

Constraints: condition to be satisfies- eg: maximum stress limits at truss

Decision variables: Their values need to be changed to optimize the solution eg: Cross sectional area

Inputs: Constants that define the problem eg: Modulus of elasticity

Assign the following terms to the main components from question 1 according to their use in the experimental task.

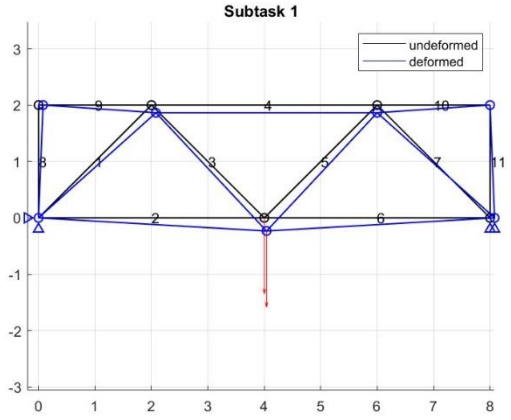
Total axial stiffness/mass : Constraints

Cross-sectional area of the beam: Decision Variable

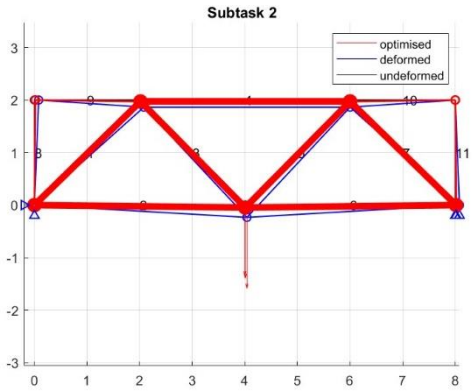
Displacement at the load application node: Objective function

Stress: Constraints

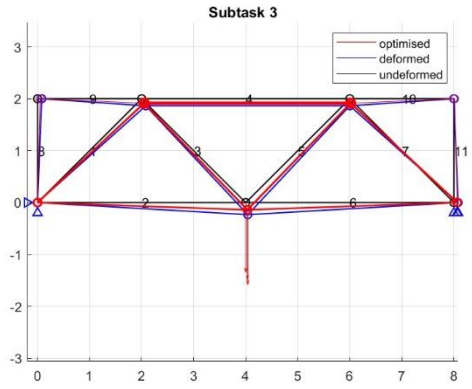
Plots from each subtask:



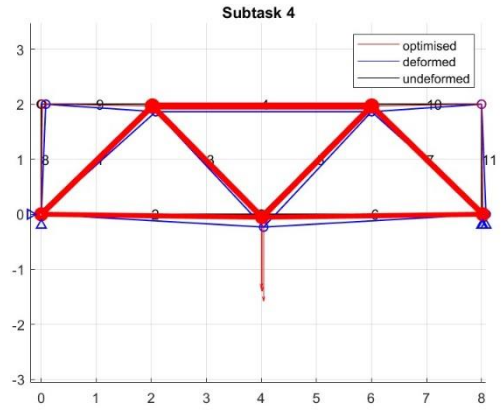
Deformed and undeformed truss



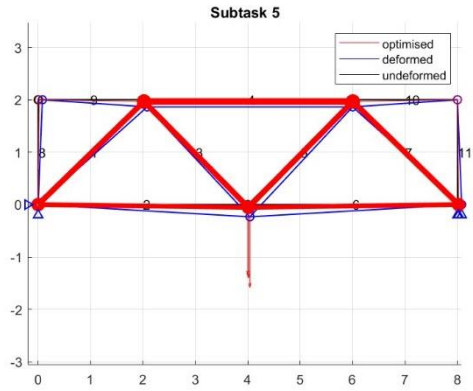
Optimised truss structure



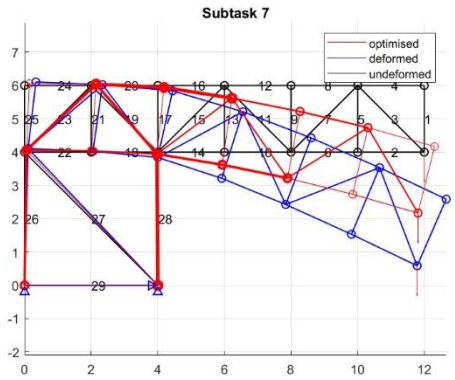
Optimized truss with constraint (stiffness)



Optimized truss with constraints (stiffness and stress)



Truss structure (efficiency of optimization)



Optimised crane structure

Results: For optimized crane structure:

Optimised y displacement = -1.8299

EA_scaled	x_opt	u
0.75	0.01	-0.1885
48.6629	0.6488	-1.8299
81.8417	1.0912	0.3087
0.75	0.01	-1.8299
0.75	0.01	-0.1474
48.6634	0.6488	-1.2637
81.8418	1.0912	0.3087
97.3267	1.2977	-1.2637
0.75	0.01	-0.1063
145.9898	1.9465	-0.7796
81.8415	1.0912	0.2676
97.3265	1.2977	-0.7796
0.75	0.01	-0.0652
145.9898	1.9465	-0.3778
81.8413	1.0912	0.2265
194.6527	2.5954	-0.3778

0.75	0.01	-0.0241
97.3264	1.2977	-0.0581
163.6827	2.1824	0.1854
194.6527	2.5954	-0.0581
0.75	0.01	0.017
97.3264	1.2977	0.0411
163.6828	2.1824	0.1443
0.75	0.01	0.0411
0.75	0.01	0.0581
137.6405	1.8352	0.0581
0.75	0.01	0.1443
206.4604	2.7528	0.0581
0.75	0.01	0
		0
		0
		0