|  |  |
| --- | --- |
| Last Name |  |
| First Name |  |

**Task 1**. **Analysis of a truss bridge**

1. Paste a screenshot of the **form** and **force** **diagram** obtained for the truss bridge:

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| --- |
| screenshot of the Rhino viewport,  showing the form and force diagram  for the truss bridge |

Now, activate the **Edge Labels** on the form diagram and paste a screenshot of the bridge with the edge labels activated below. You will use the edge numbers to answer to the following questions (Note: feel free to turn it off after you have pasted the screenshot below).

|  |
| --- |
| screenshot of the form diagram with  edge labels ON so you can refer  **in the following questions** |

Q1: List the members of the structure that are in tension, and the ones that are in compression (refer to the edge number you printed in the figure above).

…

Q2: What is the member of the structure that has the highest force? Identify this member in the form diagram (refer to its edge number). What is the force carried by this member of the structure? Is this force in tension or compression?

…

Q3: Calculate the cost of the structure, represented by the load-path and write down the value below:

…

1. Now, perform a geometric modification in the geometry of the structure such that the maximum force observed in the member (or members) identified in Q2 is reduced. Paste a screenshot of the new form and force diagrams:

|  |
| --- |
| screenshot of the form and force diagrams  after a modification is performed to reduce the load  **in the member carrying the highest load.**  (No edge labels required anymore) |

Q4: What is the new force in the highest stressed member? Is this member the same one you identified before (in Q2)? Is the force carried by this edge in tension or compression?

…

Q5: What is the new load-path of the structure? How does it compare with the value calculated in Q3? What can you conclude about the material efficiency of your new design? (max. 25 word)

…

…

**Task 2**. **Constant Force Bridges**

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Design a bridge supporting the deck, respecting the deck inclination, loads applied and boundary conditions. Provide 2 solutions as required in the exercise.

1. Design A where the deck is supported by below with a structure using constant force members in tension.

You should first sketch a structure that does not respect all the constraints required and fine tune it later on, place a screenshot of your initial structure below:

|  |
| --- |
| screenshot of the form and force diagrams  that you used to initiate the bridge of design A. |

Modify the form and force diagrams to find the constant force design B by adding constraints or doing modifications manually to the form/force diagrams. Place the final result below:

|  |
| --- |
| screenshot of the form and force diagrams  of your final design B. |

Q6: Describe the steps you took from your initial structure to the final design B, where the structure is supported by above with a constant force member in compression (max. 50 words):

...

…

1. Design B where the deck is supported by above with a structure using constant force members in compression.

You should first sketch a structure that does not respect all the constraints required and fine tune it later on, place a screenshot of your initial structure below:

|  |
| --- |
| screenshot of the form and force diagrams  that you used to initiate the bridge of design B. |

Modify the form and force diagrams to find the constant force design A by adding constraints or doing modifications manually to the form/force diagrams. Place the final result below:

|  |
| --- |
| screenshot of the form and force diagrams  of your final design B. |

Q7: Describe the steps you took from your initial structure to the final design B, where the structure is supported by above with a constant force member in compression (max. 50 words):

…

…

Q8: What would you take into account to make a decision among designs A and B? (max. 50 words):

…

…

**Task 3**. **Design your bridge**

Design your own bridge using the requirements from the exercise and place the screenshot below:

|  |
| --- |
| screenshot of the form and force diagrams  of your bridge design. |

Q9: Describe briefly the main structural and architectural aspects of your design and why you chose it (max. 50 words):

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..

Q10: Describe which constraints, or modifications to form or force diagrams you used to tune the final result to your intents (max. 50 words):

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