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| **MECH1280: Semester 2 Composites Material Testing and Selection:**  **Laboratory Assignment** |

1. **Design Brief**

What are the considerations for materials selection?

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[3 marks]

List the company’s specifications.

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[5 marks]

1. **Consideration of Methods**

In this laboratory you will carry out a three-point bend test, justify why this is an appropriate test to use to gain the data required.

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[3 marks]

1. **Experimental Results**

From the data you collect in the laboratory, plot load/displacement graphs and show them below

(copy and paste from Excel – or MatLab).

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[3 marks]

Use the table below to summarise the load and displacement data (i.e. at yield point and at fracture or failure point).

**Table 1:** Data from load/displacement graph

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| Dimensions/physical description | Specimen 1: | Specimen 2: | Specimen 3: |
| Thickness (d) [mm] |  |  |  |
| Breadth (b) [mm] |  |  |  |
| Length between 2 lower supports (L) [mm] |  |  |  |
| Maximum failure load (F) [assign appropriate unit] |  |  |  |
| Displacement at max. failure load (δ) [assign appropriate unit] |  |  |  |
| Fracture description  (*Look at how the materials are structured in the lab information pictures and how they behave in the load/displacement graphs – now describe how you think they fractured in the laboratory*) |  |  |  |

[12 marks]

1. **Calculated Material Properties**

Complete the table below with the calculated material properties for each material. Show your working solutions in the appendix section.

**Table 2:** Material properties derived from the test

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| --- | --- | --- | --- | --- |
| Material | 2nd moment of area (I) or moment of inertia [assign appropriate unit] | Material property:  Flexural strength (σfs) [assign appropriate unit] | Material property:  Flexural strain at flexural strength (εfs) [assign appropriate unit] | Material property:  Flexural modulus (E) [assign appropriate unit] |
| Plywood |  |  |  |  |
| Carbon fibre/foam panel |  |  |  |  |
| MDF |  |  |  |  |

[16 marks]

1. **Calculate Total Load**

Considering the dimensions of the go-kart barrier, what is the failure load for your materials? Show the equations used and working solution below. *(You can either use pen & paper and take a picture and insert it in the space provided, OR you can type it in using the equation function. The main thing is that it is clear and readable)*

**Calculations:**

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Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Failure load: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Failure load: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Failure load: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[6 marks]

1. **Material Selection**

Which material that you tested would be most suitable and why?

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[3 marks]

1. **Discussion**

**Do your own independent research to help answer the questions below.**

1. What other materials would you consider for this application and why?

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[5 marks]

1. What other test could have been carried out to help you decide the most suitable material? In your answer specifically state what information could be gained from the test.

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[4 marks]

**Appendix:**

Show your calculations for section 4 below (use additional sheets if necessary). *(You can either use pen & paper and take a picture and insert it in the space provided, OR you can type it in using the equation function. The main thing is that it is clear and readable)*

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