Loughborough University

SUSTAINABLE PRODUCT DESIGN

23WSP437

Semester 2 | In-Person Exam paper

This examination is to take place in-person at a central University venue under exam conditions. The standard length of time for this paper is **2 hours**.

You will not be able to leave the exam hall for the first 30 or final 15 minutes of your exam. Your invigilator will collect your exam paper when you have finished.

Help during the exam

Invigilators are not able to answer queries about the content of your exam paper. Instead, please make a note of your query in your answer script to be considered during the marking process.

If you feel unwell, please raise your hand so that an invigilator can assist you.

Answer **ALL THREE** questions.

All questions carry equal marks.

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1. An office manager is looking to complete a simple Eco-Indicator based comparative Life-Cycle Assessment (LCA) of two coffee machines to inform their purchasing decision. One of the machines (A) uses a hot plate to keep the coffee warm the other (B) a thermos. Both machines have the same capacity of 8 cups. Coffee machine A has an expected lifespan of 10 years whilst B has an expected lifespan of 5 years. The office works 5 days a week and has 2 coffee breaks plus a lunch break.

a) Propose a suitable 'Functional Unit' statement for this Eco-Indicator LCA exercise. [4 marks]

b) Explain the steps that the office manager will need to follow in order to complete the Eco-Indicator assessment. Assume that they have access to the eco-indicator database of materials, processes etc. and the assessment form. [12 marks]

c) The LCA identifies that machine B with a thermos has the lowest impact however initial trials show that 50% or more of the coffee made with this machine is wasted. Suggest 2 alternatives (machines or processes) that the office manager might consider to address this, and what might be their unintended environmental consequences. [4 marks]

2. The rapid growth in the sale of Electric Vehicles (EV) has significantly increased pressure on manufacturers to extend the useful life and to improve end-of-life recovery of their products.

a) State four key considerations in the 'Design for Disassembly' (DfD) approach. [4 marks]

b) With the aid of examples, explain how these four DfD considerations could be used to improve the design of future EVs. [16 Marks]

3. Dishwashers have become one of the most widely used electrical household appliances in UK homes.

a) Propose four eco-design recommendations to reduce the negative environmental impacts associated with a dishwasher during its life cycle. [12 marks]

b) Describe the use of the 'eco-design portfolio' tool and demonstrate how it could be used to prioritise the order in which you would implement your design recommendations. [8 marks]

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