



# **APS111 Engineering Strategies & Practice I**

## **Final Exam**

Instructors: Cheryl Runke and Ben Kinsella

April 18, 2022 – 2:00 – 4:30 PM - 2.5 hours

**Type A Exam:** A “closed book” examination. No aids are permitted other than the information printed on the examination paper and other than a paper translation-only dictionary (no definitions). Calculators are NOT permitted.

First name (please write as legibly as possible within the boxes)

Last name

Student Number

### **Instructions:**

1. Ensure that you have both the Final Exam Booklet and the Final Exam Client Statement.
  2. There are 50 marks in total on this exam.
  3. Write your identification information on the first page of the Final Exam Booklet
  4. Read each question carefully and answer in the space provided. You are not to use additional space. If you need scrap paper for draft work, ask an invigilator.
  5. Write full sentences and complete paragraphs where appropriate.
  6. Marks for each question are indicated in square brackets [ ].
  7. Expected word count for questions are suggested in the square brackets [ ]. This is a guideline and **NOT** a strict limit.
  8. When appropriate, you may draw upon your own engineering expertise. You will not be required to have references as you normally would.
  9. At the end of the exam hand in the Final Exam Booklet, this booklet. You do **NOT** have to hand in the Client Statement.



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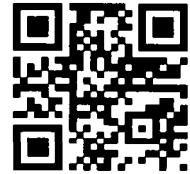
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**YOU CAN DO THIS.**

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*All questions pertain to the Client Statement: The Ultimate Commuter Student Backpack*

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1. If you were working on this Client Statement, you would need to conduct research. Give **THREE research** questions you would need to investigate. For each question, give a **TYPE** of source that would provide credible information to answer that question. In other words, where would you go to find this information? *[6 Marks; <50 words]*



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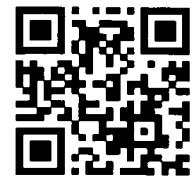
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2. Identify the functionality for the design problem using the four steps below (2.a to 2.d)

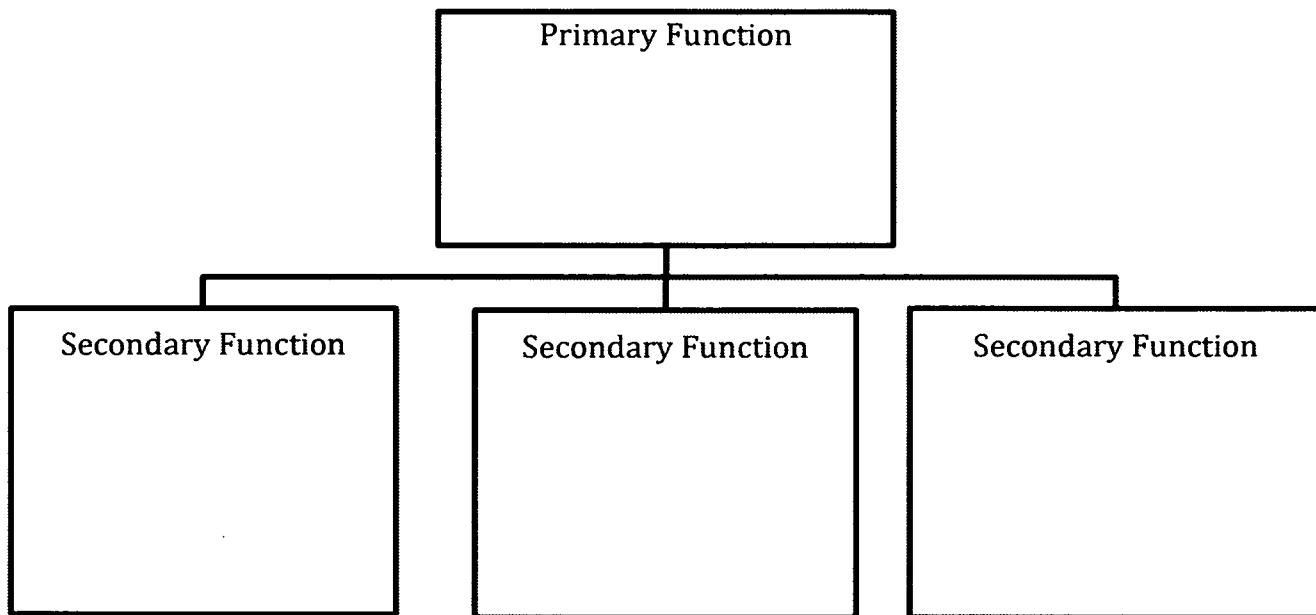
- a. Identify **ONE** Gap for the Client Statement. Making direct reference to the Client Statement, justify and explain why you are defining the “**Gap**” this way? Identify **ONE** “**Need**” based on this “**Gap**”. If you give more than one, only the first will be marked. *[3 Marks; <25 words]*

- b. Write **ONE** Functional Basis for the Client Statement that addresses the Gap in Question 2.a. You must use one of the specific components/flows associated with Functional Basis, and one action or operation. This Functional Basis must use the proper two-component format without qualifiers. If you give more than one Functional Basis, only the first will be marked. *[2 Marks; 2-3 words]*

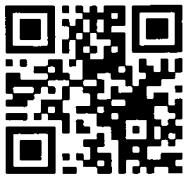
- c. Write **ONE** Primary Function based on the above Functional Basis in Question 2.b. If you give more than one Primary Function, only the first one will be marked. *[2 Marks; 10 words]*



- d. Use Functional Decomposition to derive **THREE** Secondary Functions. Fill in the Functional Decomposition chart (below), including your Primary Function and three Secondary Functions. Do not include more than **THREE** Secondary Functions. If you do, only the first three will be marked. *[3 Marks; <25 words]*



3. Identify **ONE** important aspect of the Service Environment from the Client Statement. Give evidence and explain your claim. If you identify more than one aspect, only the first will be marked. *[3 Mark; <25 words]*



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4. Based on how you identified functionality in Question 2, identify Objectives for the design problem in the sections below (parts 4.a – 4.b).
- a. Write **THREE** Objectives for this design problem, including a metric (a goal is not required). Do **NOT** include more than **THREE** Objectives. If you do, only the first three will be marked. You are not required to support these metrics with research, as you normally would in a design document. *[3 Marks; 150 words]*

- b. Use a Pairwise Comparison table to rank these Objectives. Include this table in the space below and make the final ranking of your Objectives clear. While you do not have access to external research, make reasonable estimations and provide justification to enhance the persuasiveness of your final rankings. *[4 Marks; <100 words]*



5. Ideate using a Morphological Chart. Using your Secondary Functions from Question 2, complete the table below. You should put your Secondary Functions down the initial column and the Means across each row. Include **THREE** Means for each of your three Secondary Functions. If you include more than three, only the first three will be marked. The more innovative and distinctly different the Means are, the more marks you will receive. You may include a labelled sketch, but it is not required. Draw lines through this Morphological Chart to generate **THREE** complete solutions that you will discuss further in Question 6. [9 marks; <100 words]

	Means	Means	Means
Secondary Function 1			
Secondary Function 2			
Secondary Function 3			



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6. Describe **THREE** feasible design alternatives (from the Morphological Chart in Question 5) for this Client Statement using a parallel, multimodal approach. The more innovative and distinctly different the approaches of the design alternatives, the more marks you will receive. Describe each design in the space provided for that design. If you include more than three designs, only the first three will be marked. [9 Marks (3 Marks per Design); <300 words (<100 words per Design)]

Design #1:

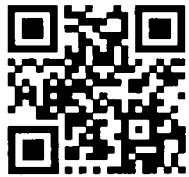
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Design #2:



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Design #3:



7. Using the **THREE** Objectives generated in Question 4, use the Pugh Method to compare your three alternative designs (in Question 6). As you cannot complete any verification, clearly explain your reasoning for each comparison. Include your completed Pugh Method chart in the space below. Clearly determine and state a recommended alternative design and justify it using the Pugh Chart. [6 Marks; <150 words]



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