University of Toronto
Faculty of Applied Science and Engineering
APS111T Engineering Strategies and Practice
Course Instructor: Jason Bazylak
Communication Instructor: Maria Cioni
Final Examination
Apr 20, 2017
2 pm to 4:30 pm (2.5 hours)

Student Name:	
UTor Email:	

Please print clearly

Final Examination Instructions

1. Ensure that you have all 12 pages of this Final exam and the separate one-page Final Exam RFP.
2. You have 2.5 hours to complete this exam.
3. Write your name and UTor Email address on this booklet.
4. Read each question carefully. All questions should be answered directly in this booklet in the box provided.
5. If you need scrap paper for draft work ask an invigilator.
6. Write in complete sentences and complete paragraphs were applicable.
7. Marks for each question are indicated in square brackets [ ].
8. Circle the number "1." on page 2 for a bonus mark.
9. This is a Type A Closed book examination; no aids permitted. You are allowed a paper translation-only dictionary (no definitions).
10. Where needed draw upon your own engineering expertise. You will not be required to have references as you normally would.
11. At the end of the exam hand in this booklet. You do not need to hand in the RFP.

1. Circle T (TRUE) or F (False) for each statement below. If the answer is FALSE, then rewrite the entire statement to make the statement TRUE. There may be multiple ways to do this, just pick one. [1 Mark each; total 10 Marks]

   a. [T or F]: In the design process, you do research to investigate existing knowledge and to develop new knowledge.

   b. [T or F]: The purpose of the Project Requirements (PR) is to define the design.

   c. [T or F]: Use idea generation techniques to counter your bias and design fixation.

   d. [T or F]: Idea selection defines the client's need by specifying the boundaries of the design problem.

   e. [T or F]: Considering the most-to-least method to prevent negative environmental impact, an engineering designer would: Reuse, Reduce, Recycle.

   f. [T or F]: A Life Cycle Diagram is a way to visualize potential environmental impacts.

   g. [T or F]: Elon Musk was talking about environmental design when he said, "Any product that needs a manual to work is broken."

   h. [T or F]: Monthly rent is an example of an external cost.

   i. [T or F]: Means is what the design must do.

   j. [T or F]: A constraint goal is what the design tries to meet.

2. In developing the next iteration of a document, you should apply "CPR". State what this is and how to apply it. [3 Marks]

3. The Fry Shack, a new restaurant, contracts you to recommend which French Fry fryer to buy. They have narrowed it down to two options. Based on an economic analysis which fryer to maintain a cook rate of 1 order of fries per minute? [4 Marks]

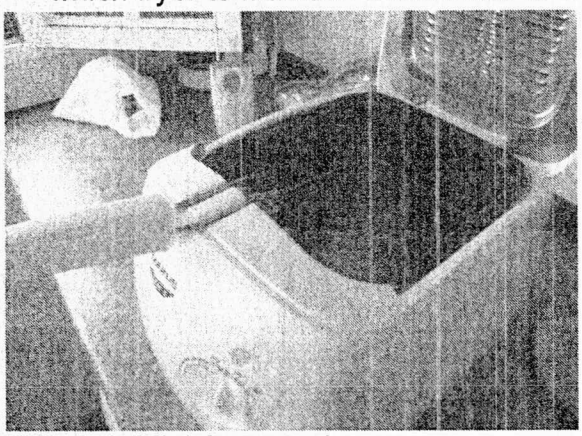


Figure 1: Mini-fry-o-matic

- Counter top electric fryer
- Purchase price: $50
- Electricity: $450/year/fryer
- Lifespan: ~ 1 year
- 4 minutes to make 1 order of fries

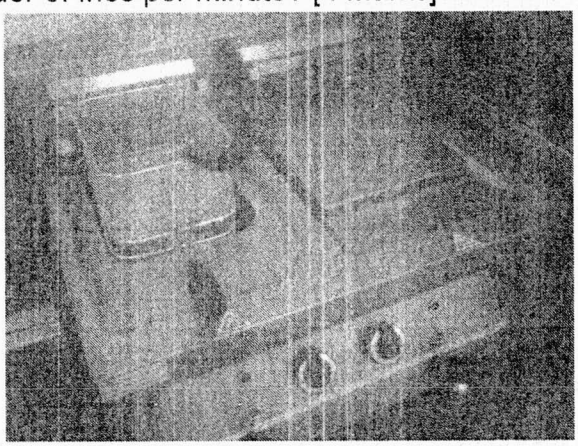
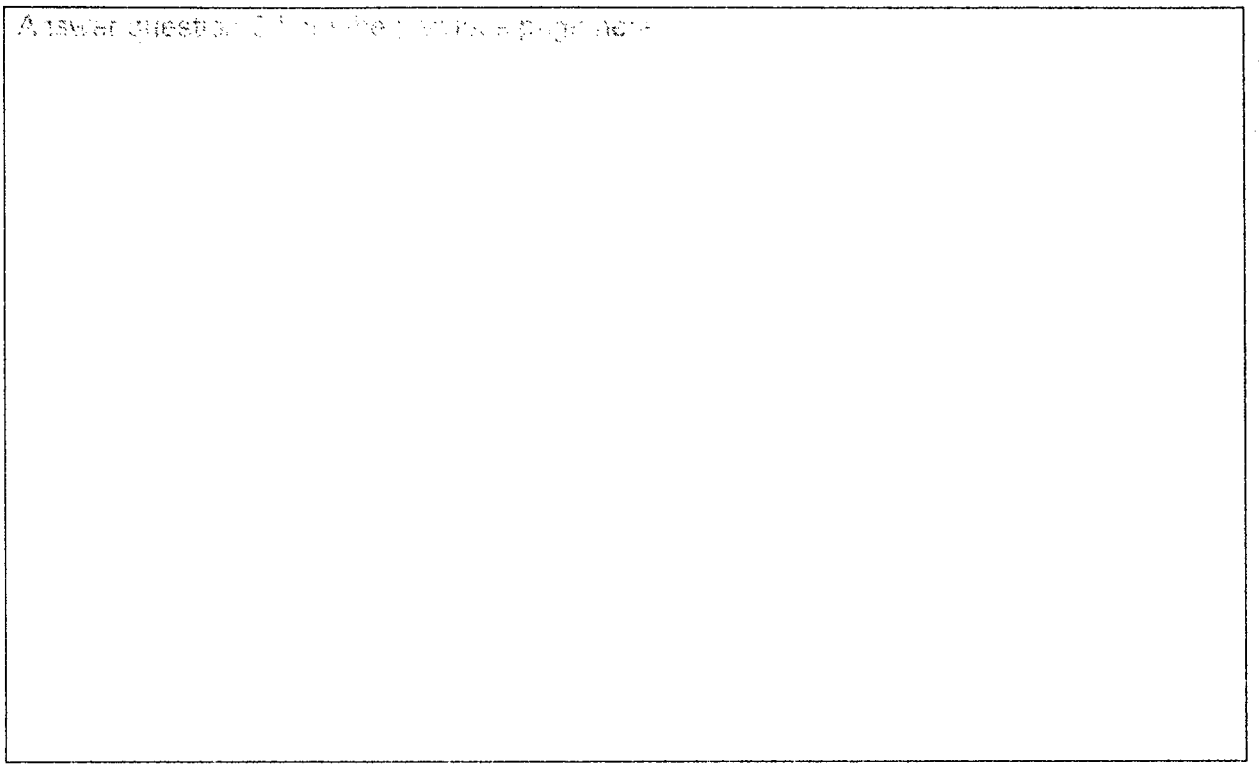


Figure 2: De Uber Fryer

- Large natural gas fryer
- Purchase price: $2000
- Natural gas: $1000/year/fryer
- Lifespan: ~ 4 years
- 1 minute to make 1 order of fries



Questions 4 to 19 pertain to the Request for Proposal (RFP) – Drill Bit Sorter

4. Write a Functional Basis for the problem described in the RFP. Use the specific terms discussed in lecture and no additional qualifiers. [2 Marks]

5. Write a Problem Statement for the RFP. [10 Marks]

6. Write two Functions for the design. For each identify the type of Function. At least one must be the primary Function. [4 Marks]

7. Write three Objectives complete with metrics and goals. [6 Marks]

8. Rank your Objectives using a Pairwise Comparison. [3 Marks]

9. Write two Constraints complete with limits. [4 Marks]

10. Identify one relevant Stakeholder and their interest. Provide either one Function, Objective, or Constraint (FOC) that could be derived from their interest. This can be the same FOC determined elsewhere in the exam, but you must clearly indicate how it is derived from the Stakeholder interest. [3 Marks]

11. Identify one specific aspect of the Service Environment (no reference needed, just draw upon your own engineering expertise). Provide one FOC that could be derived from this aspect. This can be the same FOC determined elsewhere in the exam, but you must clearly indicate how it is derived from the Service Environment. [2 Marks]

12. Write one closed question you would ask the client in the first meeting to help you determine FOC's. [1 Mark]

13. Using an idea generation method other than Brainstorming/Enumeration generate and describe three **feasible** design alternatives. Identify which technique or techniques were used to generate the ideas. The more creative, innovative and distinctly different the approaches the more Marks you will receive. [10 Marks]

14. Use a Weighted Decision Matrix and the three Objectives you generated to recommend one of your design alternatives. [10 Marks]

15. Highlight either an existing feature of your recommended design or add a feature specifically explaining how it is linked to Universal Design. [3 Marks]

16. Highlight an existing feature of your recommended design or add a feature specifically explaining how it is linked to the 3 R's. [3 Marks]

17. If you were presenting the feature in Q. 15 or 16 to the client in an oral presentation, what would be the header on the slide? [2 Marks]

18. If you were really doing this case study project, you would need to do research. Give three examples of research questions/areas you need to investigate and the type of source that would provide the credible information. [6 Marks]

19. Using the language of the course, what does Figure 3 in the RFP represent? As an engineering designer what danger does it pose to your design process? [2 Marks]