Name: _____ Student Number: _____

UNIVERSITY OF TORONTO

FACULTY OF APPLIED SCIENCE AND ENGINEERING

APS111TH1S: ENGINEERING STRATEGIES AND PRACTICE I

COURSE INSTRUCTORS: IVEY CHIU AND DARIO DEL DEGAN

FINAL EXAMINATION

April 28, 2009

Calculator Type: Type 3

Exam Type: Type A

The time allocation for this final exam is 2.5 hours consisting of Section 1: Engineering Design, and Section 2: Engineering Communications. Answer all questions in the space provided. Do not write on the back of the page. Exam booklets will be provided as scrap paper for rough work ONLY. Please be sure your answers are clear and legible. Please write all answers in dark ink. Use a strike-through line to indicate a correction (E.g. ~~This is what how to indicate a correction in your written answers~~). This is a closed book exam. Only calculators from the list of those approved by the faculty are allowed. No other aids are permitted.

This exam is worth 123 marks. An additional 10 marks will be allocated for correct language use for a total of 133 marks.

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Section 1: Engineering Design [82 marks]

1. Any toy advertised, sold, or imported in Canada must meet the safety requirements defined in the [1]: _____
   _____

2. Functions are phrased using this type of word _____; objectives using this word _____ ;and constraints using this word _____. [3]

3. Explain why we study design as engineers [1]:
   _____
   _____

4. Using the stages of the modified Dym & Little model of design applicable to APS 111, briefly describe the purpose of the stage, the inputs to the stage, a method associated with the stage, and the outputs [9].
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

5. In a 3x3 pairwise comparison, one objective received a "2" and one objective received a "1". Comment on the significance of this, making a distinction between absolute and relative importance [1]:
   _____
   _____

6. In a weighted decision matrix:

   a) How would you calculate the total for an alternative if the alternative violates a constraint? [1]
   _____

b) If the total for the first alternative is 5.9, and the total for the third alternative is 6.0, would you automatically select the third alternative? [1]

7. a) Explain how a decision made at the organizational level can affect humans at the physical and psychological levels. Include effects at the team level. Use the medical personnel example provided in lecture and in Vicente's text [6]:

b) What was done at the political level to prevent events such as this from happening again [1]?

8. What are the four stages of life cycle analysis? [4]

9. Identify the steps required in stage 2 of life cycle analysis [3]:

10. List three ways you can reduce the residuals in your design from the start of the design process [3].

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11. Give three reasons why you would want to reduce the residuals in your design [3]:

12. a) Write out the equation for determining True Profit and explain each term. Be sure to differentiate between the different types of costs in the equation and in the expanded terms [4]:

    b) Identify the which type of profit that two different stakeholder groups try to maximize [2]:

13. Distinguish between operating costs and capital costs. Give two examples of each type of cost with correct units [2]:

14. Explain how you can compare $\$X$ that you spend today, versus the same $\$X$ you will spend Y years from now. Do not use any equations [2]:

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15. You currently sell widgets for $100. The project manager for a large engineering firm has told you that she will need widgets in two years' time for the completion of a project. She says that she will pay you $115 per widget in two years. Would you accept that price? Why or why not? As you cannot accept more or less than the present value at any time, tell her how much she needs to pay you. Assume an annual compounded discount rate of 10%. Provide your answer to the nearest cent. Show all your steps and briefly define all the terms in any equation you may choose to use [7]:

16. Your cousin is about to graduate from a large Ontario university with a degree in engineering. He received his Iron Ring back in March. During the summers, he worked for an engineering company and is now applying for a full time job with them. You noticed that he added the title "P.Eng." to his resume. Explain whether or not he can call himself P.Eng. [4]:

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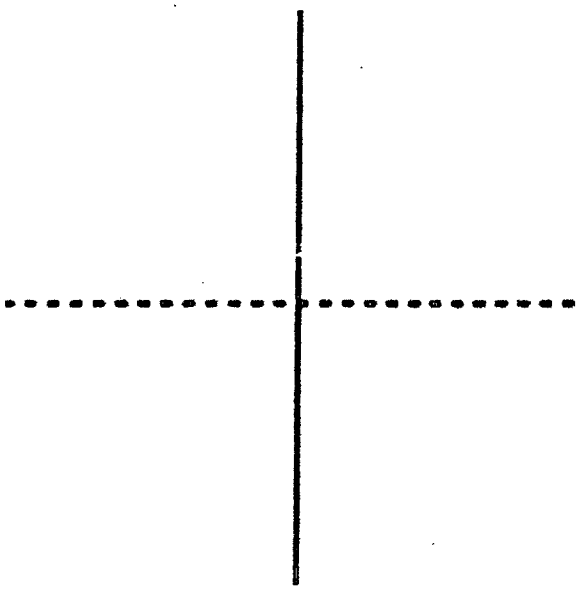
17. a) Label the quadrants and axes of the Ethics/Law matrix below. Comment on each of the quadrants, including which quadrant you would want to operate as an engineering [5]:



b) Explain why one of the lines in the matrix is solid, and why the other one is dotted [2]:

_____

_____

18. a) In the ethics case study discussed in class, and in Dym & Little, what did LeMessurier design [1]?

_____

b) Describe two of the innovative features of his design [2]:

_____

_____

_____

_____

c) Describe LeMessurier's ethical dilemma. Using the Law/Ethics matrix, comment on the legal and ethical issues of his dilemma [4]:

d) What was LeMessurier's ultimate decision and what were his subsequent actions? What might have been the consequences had LeMessurier decided to make a different decision [2]?

e) Did LeMesseurier's ultimate decision and actions agree with the PEO Code of Ethics? Why or why not [2]?

19. a) What is a tort [1]?

b) List two ways in which you can commit a tort [2]:

20. Write the "equation" that defines a contract and explain each term [3]:

Section 2: Engineering Communications [41 marks]

1. a) One of the eight ESP communication goals is the ability to formulate and utilize credible statements in engineering documentation. Identify and explain the components required to make a credible statement [2].

b) Formulate a credible statement regarding the importance of pseudocode to software design based on the information provided. Remember that a credible statement does not necessarily have to be formulated in one sentence [2].

Pseudocode strikes a precarious balance between the understandability and informality of English and the precision of code. If we write an algorithm in English, the description may be at so high a level that it is difficult to analyze the algorithm and to transform it into code. If instead we write the algorithm in code, we have invested a lot of time in determining the details of an algorithm we may not choose to implement (as we typically wish to analyze algorithms BEFORE deciding which one to implement). The goal of writing pseudocode, then, is to provide a high-level description of an algorithm, which facilitates analysis and eventual coding (should it be deemed to be a "good" algorithm) but at the same time suppresses many of the details that vanish with asymptotic notation. Finding the right level in the tradeoff between readability and precision can be tricky.

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2. Formulate a Compound/Complex sentence based on the information below [1]:

   - Sanyo manufactures Video Cassette Recorders.
   - Sanyo desires to expand its market.
   - The Sales Director at Sanyo feels the company has exhausted the possibilities for Video Cassette Recorders.

3. Write the IEEE bibliographic entry for the following web site. Number the reference as your first. Ensure all punctuation marks are accurate [1].

   Author: T. Land
   Title: Web extension to American Psychological Association styles (WEAPAS)
   Date: March 31, 1996
   Date Viewed: September 14, 1996
   URL: http://www.nyu.edu/pages/psychology/WEAPAS

4. Construct a short paragraph outlining a service environment based on the information in the bullet list below [5].

   Sand
   Children's Playpen
   Water
   Outdoors
   Indoors

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5. a) The following paragraphs contain 10 writing errors/problems. Identify five of the errors by circling each error and labeling the errors 1 through 5 [5].

University College (UC) are located in the heart of the St. George Campus of the University of Toronto. It's built 150 years ago and is now a proud national historic site. Their is, however, a growing concern for this national historic site regarding the waste storage facility currently in place.

To address these concerns, current waste system must be looked at and analyzed. According to the dataum, the waste storage facility is located north west of the building, open to the back campus, next to a walkway and a bicycle path. The waste container located on site each hold a specific type of waste, including recyclables or garbage.

Recently, however there seems to have been an excessive amount of waste due to the growing population of UC, and to the waste management agreement between Sir Daniel William's residence and UC. They collect this waste produced by both University College and Sir Daniel Wilson's residence - at various time of the day. Different waste removal trucks belonging to different companies handle specific types of waste (i.e. plastics, papers). These trucks access the waste containers through a narrow driveway at the back of University College where they maneuver their way in, collect the waste, and take there leave. The principal concern is to solve those problem.

b) Fix each of the errors identified with proper sentences [5]

6. Outline the Stakeholders affected by the object you selected for your seminar presentation [4].

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7. Describe the Environmental Impact and Life Cycle of the object you selected for your seminar presentation. Include a brief diagram [4].

8. Describe the Social Impact of the object you selected for your seminar presentation [4].

9. Outline the various rungs of the Human-tech ladder of the object you selected for your seminar presentation [4].

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10. Outline the types of Economic costs of the object you selected for your seminar presentation [4].