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APS111 Engineering Strategies and Practice

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Midterm Examination

October 26, 2004

This is a 1 hour and 30 minute exam. The midterm is closed book and closed notes. Answer all parts of all questions. Your answers must be well structured, clear, concise, and complete in order to obtain the maximum credit. The mark values for each question are given to help you allocate your time. You must write your answers directly on this sheet.

Please **write clearly**. We cannot give you marks if we cannot read your work.

Exam: 9 pages

4 sections

To get full credit you must **answer all parts of all questions**.

Section I Multiple Choice: 10 marks.

Circle the letter preceding the correct answer to each question on the exam sheet.

- 1) Which of the follow is/are not part of the organising phase of team development?
 - a. Forming
 - b. Performing
 - c. Norming
 - d. Production
 - e. b & d
 - f. c & d

- 2) Which step in the design process is the most important?
 - a. Problem definition
 - b. Evaluation of the concepts
 - c. Concept Generation
 - d. Gathering of information
 - e. Development of metrics
 - f. Detailed design

- 3) Which of the following is/are a component of an audience analysis?
 - a. Background
 - b. Attitude toward communication
 - c. Assumptions
 - d. What's known about project
 - e. All of the above
 - f. a & c

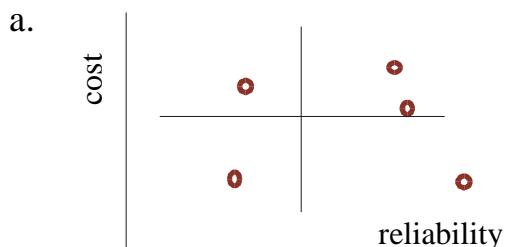
- 4) Which one of the following does not belong in the problem statement?
 - a. Goals
 - b. Possible solutions
 - c. Constraints
 - d. Description of the current situation
 - e. Functional requirements
 - f. c & d

- 5) Which of the following problem solving tools can be used to organize or prioritize the causes of a problem?
 - a. Brainstorming
 - b. Pairwise comparison
 - c. Affinity diagram
 - d. Nominal group technique
 - e. All of the above
 - f. b, c & d

6) What is a Pareto chart used for?

- a. Problem definition
- b. Task scheduling
- c. Cause finding
- d. Root cause analysis
- e. Interrelationships
- f. c & d

7) Which of the following shows a Gantt chart?

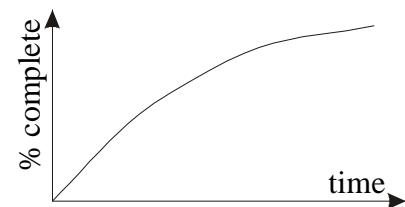


b.

| | cost | reliability |
|-------------|------|-------------|
| cost | -- | 0 |
| reliability | 1 | -- |

c.

| | wk1 | wk2 | wk3 |
|--------|-----|-----|-----|
| task 1 | | | |
| task 2 | | | |



8) The MooBella machine is an example of a:

- a. Market push product
- b. Market pull product
- c. Process intensive product
- d. Customized product
- e. a & d
- f. b & c

9) Benchmarking an existing design, does not include:

- a. Stealing information from a competing company
- b. Comparing the service efficiency of competing companies
- c. Analyzing the features of an existing design
- d. Reading relevant patents
- e. a & b
- f. a & d

10) Which of the following is/are true?

- a. The cost of the design process for a mass production product is a large contributor to the final cost of the product.
- b. Decisions made in the design process have a minimal effect on the final cost of the product.
- c. Quality must be designed into a product
- d. Quality is only a function of how well the product is manufactured.
- e. a & c
- f. b & d

Section II Short Answer: 25 marks

1) The four C's of design are _____, _____,

_____, and _____.

2) Provide the 3 important components that lead to a successful team.

a. _____

b. _____

c. _____

3) Provide three methods for gathering information from customers. _____,

_____, and _____

4) State one function, one objective, and one constraint specific to the MooBella project:

Function: _____

Objective: _____

Constraint: _____

5) Organize the following 5 objectives for an umbrella into a hierarchical tree:

- a. Should provide a large coverage area
- b. Should be safe
- c. Should not have sharp or pointy exposed parts
- d. Should fold up to a small volume
- e. Should keep the user as dry as possible

You can use the letters next to each objective in your tree, rather than writing out the whole objective over again.

6) Give three reasons for gathering information during the design process:

- a) _____
- b) _____
- c) _____

7) Rewrite the following sentence, correcting any error that you find:

Currently, companies are competing to put it's blood substitute product on the U.S. market which have been granted FDA approval.

Section III Long Answer: Marks 15:

Draw on the exam paper below the discrete steps in the design process. Show the steps which are included in the conceptual design phase and those in the detailed design phase.

Section IV Long Answer: Marks 50.

Answer questions 1 through 3 of this section in the space provided below. An additional page of scrap paper is provided, but anything on the scrap page will not be marked.

As the price of oil increases, some power plant operators are considering retrofitting their plants to use coal for fuelling their plants. However, one difficulty with coal is that it requires a large land area adjacent to the plant to store the coal when it is delivered. Depending on electricity demand, the coal may be stored on-site for up to a month. Sometimes there is not a suitable large land area near the plant that can be used for on-the-ground coal storage.

- 1) What are three questions that need to be asked and answered in order to fully define the problem?
- 2) Develop a problem statement for this situation. Include the needs statement, goals, constraints, and criteria for evaluating the design.

In a brainstorming session, your team generates the following three ideas:

- a. Underground storage containers
 - b. Use a balloon (blimp) to suspend the coal over the plant
 - c. Change suppliers to provide “just-in-time” delivery by truck
- 3) Provide an example of a morphological chart for evaluating the possible solutions for this design statement using at least 2 objectives and 1 constraint. (see page 9)

Please note that part 2) of this question will be marked for quality of writing.

3) Put morphological chart here.