

Name: _____

Student #: _____

University of Toronto
Faculty of Applied Science and Engineering
APS112 and APS113 Engineering Strategies and Practice II

Quiz #1 February 15, 2013

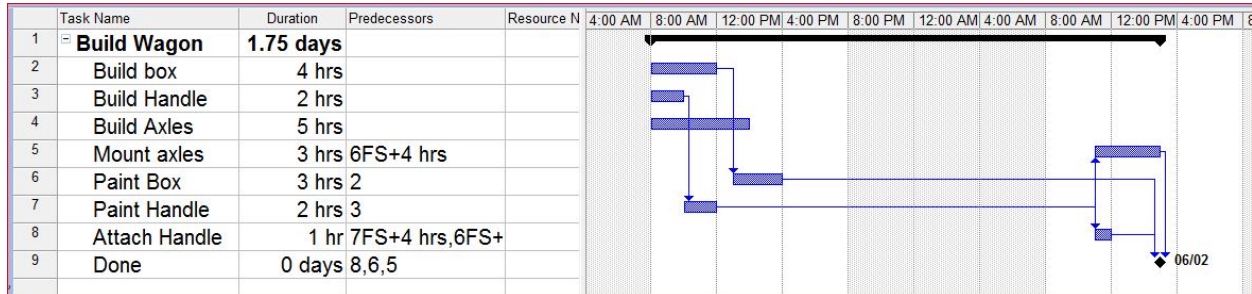
This is a 50-minute closed-book quiz. No aids are permitted except for a translation-only dictionary. The quiz has a total of 22 questions. There are 16 multiple choice questions and 6 written answer questions. There are a total of 30 marks with 16 marks for the multiple choice questions and 14 marks for the written questions.

Your question paper, with your name and student number filled in **on each page**, must be returned with the multiple choice answer sheet slipped inside. Do not separate any pages.

Good Luck!

Multiple Choice Questions (1 mark each; total of 16 marks)

For multiple choice questions, you must use the multiple choice answer sheet provided. Follow the directions on the sheet carefully to ensure that you receive marks for the correct answer. **You should mark only the single, most correct answer for each question.** Always mark the answer in the spot corresponding to the question number. Use a pencil. Erase any errors completely. There is no deduction for wrong answers.

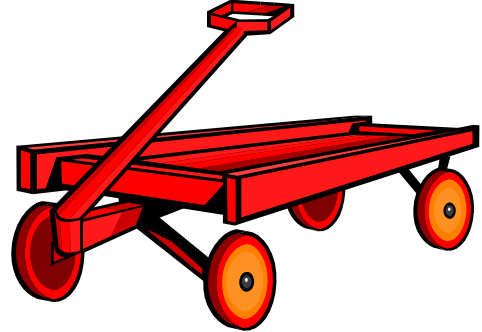


Questions 1 to 5 relate to a project “Building a wagon” such as in the picture and the Gantt chart shown.

The Gantt chart is not completely finished or correct.

- How many people (minimum) must be working at the same time for this Gantt chart to be correct?

- 1
- 2
- 3
- 4



- Task #4, “Build Axles,” is **NOT** a predecessor of any task, which is an error. It should be a predecessor of task 5, “Mount axles.” When this relationship is put into the graph, how many extra hours will it push out the end of the project?
 - 0 (There will be no change in the timing of the end of the project if this is done)
 - 1
 - 2
 - 3
- Task #5 has as its predecessor entry “6FS+4 hrs”. This means
 - Task #5 must be done within 4 hours of the end of task #6
 - Task #5 must start within 4 hours of the end of task #6
 - Task #5 must be done after a 4 hour wait from the end of task #6
 - No tasks can take place for 4 hours after the end of task #5
- To allow for the paint to dry we would
 - Assign a resource called “drying time” and assign it a task “paint dry”
 - Indicate a lag before any following task in hours
 - Indicate a lag before any following task in elapsed hours
 - Indicate a lag for the task of painting
- Which of the following is **FALSE**:
 - The critical path has all the important tasks on it.
 - Milestones have no duration.
 - Gateways are decision points in the project where a project could be cancelled.
 - An “Activity on the arrow” Pert chart sometimes requires dummy tasks.

6. Which is **NOT** an acceptable outcome of the solution selection stage?
- a. No solution available. Cancel project.
 - b. One recommended solution. Proceed with final design.
 - c. Combine solutions to create a composite solution. Iterate.
 - d. Combine solutions to create a composite solution. Proceed with final design.
7. Which is the most appropriate decision making tool to first start narrowing the design space?
- a. Weighted Decision Matrix
 - b. Statistical Risk Analysis
 - c. Pugh Method
 - d. Multi-Voting
8. If the functional basis of a project is the recovery of information, which is the most appropriate primary function?
- a. Get information from damaged hard drives
 - b. Filter noise from signals
 - c. Will follow HTML 5 standards
 - d. Mine information
9. The list first generated in a functional decomposition of a bagel slicer would look like:
- a. Secure bagel, separate bagel length-wise, release bagel
 - b. Knives, chop saws, water jet cutters, laser cutters
 - c. Safe, easy to clean, inexpensive
 - d. Brainstorming, analogy, morph chart
10. The *It Can Wait* campaign by AT&T attempts to dissuade teenagers from texting while driving. From a Design for Safety perspective this is an attempt to reduce:
- a. Ignorance
 - b. Law suits
 - c. Hazards
 - d. Risks
11. Which safer design principle should you first attempt?
- a. Avoid / eliminate the hazards
 - b. Substitute safer materials
 - c. Protect against hazards
 - d. Train to avoid hazards



12. Which is not a Design for Safety guideline:
- a. Include a safety factor
 - b. Include a failsafe
 - c. Guard against unavoidable hazards
 - d. Require multiple operators
13. An appropriate time to do a ballpark estimation instead of a more exact calculation?
- a. Not in the engineer's area of expertise
 - b. Verification of a computer model
 - c. To avoid violating a patent
 - d. In order to do a Dimensional Analysis
14. What is **NOT** an information gathering input into the PRPMP?
- a. Direct research
 - b. Convergence
 - c. Indirect research
 - d. Expertise
15. A purpose of the PRPMP is to?
- a. Recommend a design solution
 - b. Meet the client
 - c. Define criteria on which to evaluate solutions
 - d. Complete project research
16. Regarding the PRPMP, which of the following is **TRUE**?
- a. The Service Environment details how the design will operate within the environment.
 - b. The Executive Summary contains all the basic information of the report.
 - c. With functions avoid verbs and instead formulate as results.
 - d. The Identification of Stakeholders details the stakeholder's interest in the design.

Written Answer (marks per question as indicated on question; 14 marks total)

Write answers into the spaces provided on the question paper.

Client Statement #1 (Questions 17-22)

I use a motorized wheelchair (see figure 1) to get from my car to the baseball diamond to watch my daughter's baseball games. Some of the parks where the games are played do not have paved access from the street to the diamonds. Often I have to try to cross grass and sometimes mud using my wheelchair to get to the baseball diamond. More than once I have gotten stuck in a dip in the grass or in some mud. Once I even tipped over. I need you to redesign my wheelchair to increase its motor to 300 horsepower to keep me from getting stuck. The motor must be mounted on the bottom of the chair to keep the center of mass low and keep me from tipping over. The structure of the chair will need to be strengthened to handle the additional weight of the motor and the torque it will apply when running. Titanium is stronger than steel and so you can use less of it so it will save money. Please use tricks like this to keep costs low. Try to keep the new chair from costing more than my existing chair. I want mud flaps to keep me clean if I go through a puddle, and a drink holder.



17. (2 mark) The functional basis for this project is:

18. (2 marks) What is the purpose of defining the functional basis at the start of a project?

19. (2 mark) Give one stakeholder and state their interest.

20. (3 marks) Give one primary function, one objective and one constraint for the project.

Primary Function: _____

Objective: _____

Constraint: _____

Name: _____

Student #: _____

21. (3 Marks) Use the Pugh method to select which of these three alternatives methods for opening a bottle of root beer best meets the following objectives (show your work):

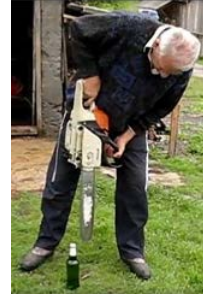
- Minimal training
- Safe
- Inexpensive



Bottle opener



Spoon



Chainsaw

The alternative that best meets the stated objectives is _____
because _____.

22. (2 marks) In general explain a limitation of the Pugh method.
