

Name: \_\_\_\_\_

Student #: \_\_\_\_\_

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

Quiz #1 February 14, 2012

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 18 multiple choice questions and 4 written answer questions. There are a total of 34 marks with 18 marks for the multiple choice questions and 16 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.

Good Luck!

**Multiple Choice Questions (1 mark each; total of 18 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.

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1. Which of the following is FALSE:
  - a. Project Management precedes any technical work.
  - b. Project Management continues after technical work is done.
  - c. There is overlap between the various stages of Project Management in an actual project.
  - d. The control stage is limited to the technical execution of the project.
  - e. Project Management is often done badly.
  
2. Which of the following is FALSE:
  - a. All projects can be represented by either “Activity on the Node” but not by “Activity on the Arrow”.
  - b. Activity on the Arrow representations sometimes require dummy tasks to properly represent the precedence of one task by another.
  - c. Typically a work breakdown structure would be developed before putting together an “Activity on the Node” graph.
  - d. A completed Gantt chart includes all the information that would be in an “Activity on the Node” graph.
  - e. This is option e.
  
3. An ESP team consists of three people: Archie, Betty and Jughead. Which of the following is FALSE:
  - a. Each person should be assigned as an individual resource.
  - b. Tasks assigned to all three people should be assigned to resource “team” on the Gantt chart.
  - c. Because the deliverables for ESP are assigned to specific dates and the resources will not be working 100% on ESP before those dates, one would not expect to see a highlighted critical path from the Microsoft Project ® software.
  - d. Overallocation can occur if the leveling is set to manual.
  - e. If someone assigned to a task has only two days to work on the task to meet the deadline, you should still set the duration based on the estimated time the task will actually take, even if this means the deadline will not be met.
  
4. Consider the following:
  1. Sharpen your skates
  2. Play a hockey game
  3. Play defense
  4. Tape your hockey stick (put friction tape onto the blade)
  5. Score a goal

Which is the full list of properly-formed tasks:

- a. 1,2,5
- b. 1,4
- c. 1,4,5
- d. 2,3
- e. 2,3,5

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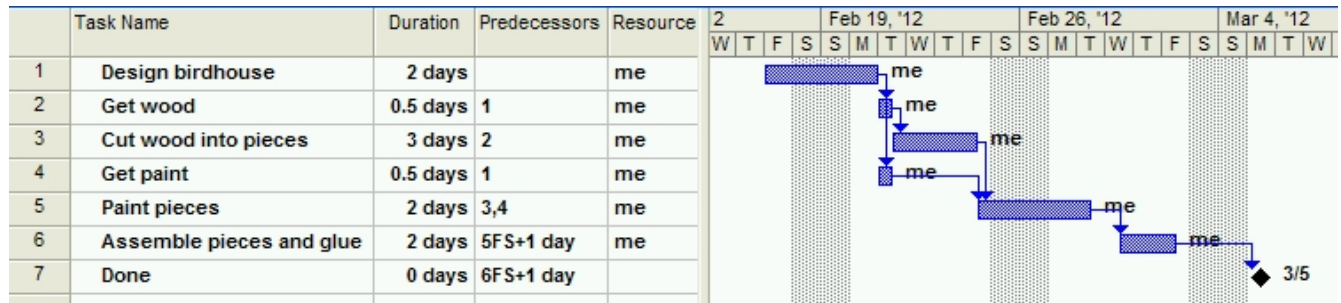


Figure 1: I'm Building a Birdhouse Gantt chart

Questions 5 - 8 refer to the project in the Gantt chart in figure 1.

5. Task #1, "Design birdhouse", has a duration of 2 days, yet the bar covers 4 days. Why is this?
  - a. The task is on the critical path.
  - b. The task is done over the weekend and I don't work weekends.
  - c. The task is done over the weekend, and the calendar used for me indicates I don't work weekends.
  - d. The task was leveled, and this extended the amount of elapsed time required.
  - e. This task has two days of slack.
6. Which of these statements about task #7, "Done", is TRUE:
  - a. The representation in the chart is a diamond because it is the last task.
  - b. 6FS+1 in "Predecessors" indicates a lag of one day before this task.
  - c. The task start date is independent of all of the other tasks.
  - d. The task is not on the critical path.
  - e. The task start cannot be moved.
7. If we level resources the birdhouse will be done on
  - a. Friday, Mar 2
  - b. Sunday, Mar 4
  - c. Monday, Mar 5
  - d. Tuesday, Mar 6
  - e. Wednesday, Mar 7
8. I get a friend to help me with the purchasing, but the friend might take a day or two to get started on the task after getting instructions on what to buy. Which task should you assign her/him to allow the project to finish as shown on the chart?
  - a. 1
  - b. 2
  - c. 3
  - d. 4
  - e. 5

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**Questions 9 – 11 refer to Client Statement #1.**

Client Statement #1

Portatech Diversions is seeking an interactive projection system that allows users to project touch screens on any surface and interact with the projection as they would with the original device. This would allow users to input more easily on smart phones, iPhones and other hand-held devices with small screens that limit the size of buttons. The projection, which would have to be visible outdoors in full sunlight, will allow users to dial phone numbers, play games, or text messages (to name a few examples). [1]

[1] P. Reso, "Innovation News Daily," 25 October 2011. [Online]. Available: <http://www.innovationnewsdaily.com/643-touch-and-tap-new-device-lets-users-use-anything-as-touchscreen.html>. [Accessed 6 February 2012].

9. The fundamental functionality for the above problem would be:
  - a. Deposit energy.
  - b. Stabilize information.
  - c. Transform energy.
  - d. Separate mass.
  - e. Transform information.
10. Which of the following statements about stakeholders and their interests is best?
  - a. Manufacturers – interest is improving their smart phones.
  - b. Users – interest is in bigger buttons on their hand-held devices.
  - c. Government agencies – interest is in protecting intellectual property.
  - d. Non-governmental agencies – interest is using new technology to project information.
  - e. Eye doctors – interest is in preventing harm caused by bright projections.
11. An appropriate constraint for the above problem would be:
  - a. Projected buttons shall be 2 cm by 2 cm in size.
  - b. Projections shall be completely visible in direct sunlight.
  - c. Projections shall be safe and non-toxic.
  - d. Projection brightness shall be at least 1300 lumens.
  - e. Projection capability shall be applicable to all smart phone designs.
12. Your team of Archie, Betty and Jughead has completed the PR/PMP, but not without conflict. Betty and Jughead have stopped talking to each other and you decide you had better mediate the conflict before you all fail your CDS. The first step you should take is:
  - a. Separate individuals from issues.
  - b. Move from the storming stage to the norming stage.
  - c. Develop criteria for selecting an option.
  - d. Create list of pro's and con's to continuing as a team.
  - e. Request a mediation session with your Project Manager.

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13. You are searching for a highly specialized diamond tipped cutter for cutting granite countertops. It is not the type of thing that could be found at the local hardware store. You should:
- Use an industrial database like Thomas Register or Global Spec.
  - Find a Wikipedia article on cutting wheels.
  - Do a Google search for “diamond tip cutters”
  - Review the patent literature to learn about cutters.
  - Start by brainstorming new designs for cutters before doing any homework.
14. Although the belt sander-based paper folder demonstrated in lecture did work, it ultimately was a poor design compared to a buckle folder. In attempting to produce an optimum design for a machine like this, the design engineer should:
- Attempt to mimic manual methods as a starting point for the design.
  - Not review the prior art to avoid restricting creativity.
  - Prototype a machine using simple components like Meccano or Lego.
  - Strive for simplicity in the conceptual design.
  - Strive for simplicity in the final implementation of the design.
15. You are trying to make a safe saw for cutting plaster casts used in a hospital when people break their bones. The best solution for dealing with the hazard of cutting the underlying skin is:
- Design a guard that fits between the cast and skin to keep the blade from touching the skin.
  - Train the doctors to set the blade depth to just less than the thickness of the plaster.
  - Give the patient painkillers just in case the saw cuts them.
  - Switch from plaster to fiberglass, which can be cut with shears.
  - Design a saw that vibrates and cuts plaster but not skin.
16. Design by analogy (Synectics) is a useful technique for deriving creative solutions. In designing a new helicopter blade, it would be reasonable for an experienced designer to:
- Draw inspiration from nature by looking at bird wings and whale flippers.
  - Look at other stiff, light structures like snowboards.
  - Survey the patent literature for the latest developments in helicopter blade technology.
  - Do a functional breakdown to determine the various sub-functions performed by the blade.
  - All of the above.

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17. In choosing the best conceptual design solution, which of the following is FALSE?
- a. The advantage of a Pugh Selection method is that it allows for a direct comparison between alternatives.
  - b. The advantage of a weighted decision matrix is that it provides a quantitative comparison between alternatives.
  - c. It is not a good idea to leave the decision to the most technically competent member of the design group.
  - d. The conceptual designs should be presented to the client, who should choose one that meets his/her needs the best.
  - e. Formal decision making tools are good because they can compensate for individual bias.
18. Which is an appropriate introduction to the functions section of your PR/PMP?
- a. Functions are what a design shall do or else the design fails.
  - b. Functions are what define the design space of a project. They are classified as primary, secondary and unintended.
  - c. See the glossary in Appendix T for the definition of a function.
  - d. In order to solve your problem our solution will need to do the following.
  - e. The fundamental function of your required design is to increase the efficiency of mass flow through your office space. In the following sections this flow of mass is broken down into several basic functions.

**Written Answer (marks per question as indicated on question; 16 marks total)**

Written questions must be answered in the spaces provided on the question paper.

19. (3 MARKS) [This question pertains to the Gantt chart in Figure 1 on page 3]
- Assuming that the friend helps and that the original Gantt chart has the proper start times for all tasks, the lag time that was added before the “Done” milestone to allow the glue to dry has forced the time of the milestone to be on the Monday. In fact, for one day of drying, the project is done on the Saturday. How can we adjust the duration (or time) designation of the lag so it reflects the true glue drying time?

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**Questions 20- 22 refer to Client Statement #2.**

Client Statement #2

Your client is putting up a new airport terminal in Boston. The terminal will be located 800 metres from the existing terminal and 10,000 passengers are expected to move between the two terminals each day. You are to design a system for moving people between the two terminals at minimum capital (initial) cost and minimal operating cost. All options are open for consideration.

20. (5 MARKS) Give one intended function, one unintended and undesirable function, two objectives and one constraint for this problem.

FUNCTIONS:

OBJECTIVES:

CONSTRAINTS:

21. (3 MARKS) Identify 3 stakeholders. In less than 5 words define an interest of theirs that might be affected by the design.

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22. (5 MARKS) Use a functional decomposition approach to find a suitable conceptual design for the people mover. Full marks will be given only for a reasonably simple, feasible solution, and provided that a good functional decomposition has been used. You may assume that you already have a properly ranked list of objectives, and a complete list of functions and constraints. You are to focus on the creative process of finding an actual solution and the method needed to find the best one.