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

Quiz #1 February 14, 2017

This is a 50-minute quiz. The quiz is closed book and closed notes. The quiz has a total of 23 questions (20 multiple-choice and 3 short-answer questions), worth 41 marks. The questions are divided between two booklets.

Question Booklet #1 – Multiple Choice Question Booklet

This booklet contains 20 multiple-choice questions, worth 1 mark each. Read each question thoroughly and provide the answer on the answer sheet (not in this booklet). Fill in your name and student number on the multiple-choice answer sheet. When providing answers on the answer sheet be sure to:

- use a pencil or pen
- fill out the answer sheet (scan sheet) clearly with no overlaps
- erase any errors completely
- This booklet is printed double sided. Look for questions on both sides of the page.
- **provide only the single, most correct answer for each question**

There is no penalty for wrong answers. Select the answer that best satisfies the question.

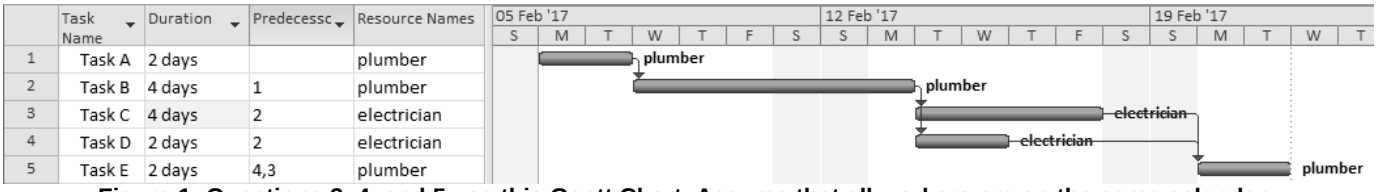
You are not required to hand in this multiple-choice question booklet.

The final 3 short-answer questions are found in the Short Answer Question Booklet.

1. Consider the following:
    i) Being in a chess club
    ii) Putting on your shoes this morning
    iii) Getting dressed this morning
    iv) Making yourself happy
    v) Completing this exam

    Which are projects in the sense of this course?
    a. Only v
    b. Only iii
    c. ii, iii and v
    d. i, ii, iii and v

2. What is **NOT** a part of a project as we've defined it?
    a. work schedule
    b. cost schedule
    c. resource schedule
    d. site insurance



	Task Name	Duration	Predecessc	Resource Names
1	Task A	2 days		plumber
2	Task B	4 days	1	plumber
3	Task C	4 days	2	electrician
4	Task D	2 days	2	electrician
5	Task E	2 days	4,3	plumber

Figure 1: Questions 3, 4, and 5 use this Gantt Chart. Assume that all workers are on the same calendar.

3. If the tasks shown in the Gantt chart (Figure 1) were presented as Pert Chart with "Activity on the arrow", what is true? (You should sketch this out.)
    a. You would need a dummy task between Task A and Task C
    b. You would need a dummy task between Task B and Task C
    c. You would need a dummy task between Task C and Task D
    d. You would not need a dummy task

4. Using the Gantt chart (Figure 1), and assuming there are two electricians, the critical path is composed of tasks:
    a. A, B, C, D, E
    b. A, B, C, E
    c. C
    d. D

5. If the project in the Gantt chart (Figure 1) was levelled because there was only one electrician, the resulting project would take:
   a. 12 work days
   b. 12 elapsed days
   c. 14 work days
   d. 16 elapsed days

Client Statement #1 – Bike Share
Questions 6 to 9 refer to this Client Statement.

In 2011 a bike-share program opened in the City of Toronto, with 1000 bikes in 80 locations. For a fee, bikes could be picked up in one location and then returned in another, provided that both locations were operated by the company (e.g. bikes could not just be locked up in any location convenient to the user). They offered both daily passes and yearly memberships to allow for the use of the bikes. In the first year of operation, the company failed to meet its revenue targets. To both increase revenue and enable long term planning, the company put a priority on increasing yearly subscriptions. They asked an ESP team to determine the reason why more people were not using these bikes and to come up with a design to address the problem.

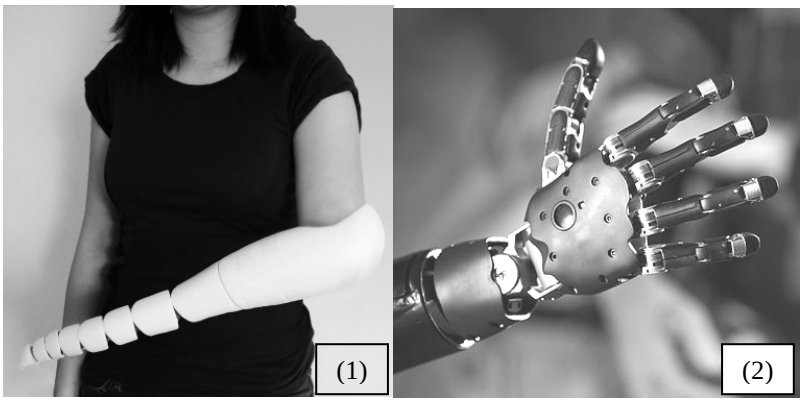
6. Based on the Client Statement, the team determined the gap to be:
   a. Not enough bikes were being provided in order to meet revenue targets.
   b. Location drop points did not allow for people to plan travel in a convenient way.
   c. The program should not be profit-making; it should be supported by government.
   d. Weekly and monthly passes should also be available for users.

7. Which of the following stakeholders/interests help the team make design decisions?
   a. Drivers/less traffic congestion and better driving conditions
   b. Bike share program/higher revenues
   c. Toronto Transit Commission/putting bike racks on buses and streetcars
   d. Local residents/noise bylaws musts be obeyed

8. Which of the following secondary functions is **NOT** viable?
   a. Safely store bicycles;
   b. Recognize Bike Share customers and allow them to unlock bikes;
   c. Help users plan their pick-up and drop-off locations;
   d. Ensure that riders return the bikes.

9. In the team discussion of the project, one member suggested the following objective: “increase membership and revenue.” The team decided not to use this objective because it is:
   a. really a function (as it is a verb, not an adjective);
   b. actually a constraint, since if it didn’t happen, the project failed;
   c. neither a function nor an objective, but an overall result;
   d. actually two objectives – increase membership and increase revenue – they should be separated.

10. The Project Management Plan in the Project Requirements and Conceptual Design Specification should include:
   a. a Gantt chart;
   b. a work breakdown structure of all tasks in the project;
   c. a range of dates for each client meeting;
   d. a description of the team’s process.



Source:
(1) Design by Kaylene Kau
http://www.coroflot.com/kaylenek/PROSTHETIC-ARM

(2) Public Domain:
https://commons.wikimedia.org/wiki/File:Brain-Controlled_Prosthetic_Arm.jpg

Figure 2: Prosthetic hands. (1) Single tentacle design; (2) standard five digit hand design

11. Compare the two prosthetic hand designs in Figure 2. Which is **TRUE**?
   a. (1) is more conceptually complex than (2) because it is not a direct mechanization of a human hand.
   b. (1) is less conceptually complex than (2) because it has one tentacle instead of five digits.
   c. (1) is has greater implementation complexity (more difficult to build) than (2) because it has one tentacle instead of five digits.
   d. (1) and (2) have equal levels of conceptual and implementation complexity.

12. The single tentacle hand design in Figure 2-1 is an example of:
    a. Design for Safety
    b. Industrial analogy
    c. Biomimetics
    d. TRIZ

13. When designing the single tentacle hand (Figure 2-1) the designer thought, “how can I redesign the standard five digit hand design (Figure 2-2), if I don’t use fingers?” This was an example of:
    a. SCAMPER
    b. Critical thinking
    c. Biomimetics
    d. Analogy

14. The single tentacle hand designer recognized a flaw in the standard hand design was that the user was vulnerable to electric shock if they gripped a live power source. The best way to deal with this hazard is to:
    a. Include a warning in the user manual to avoid live power sources.
    b. Placed a label on the hand to avoid touching live power sources.
    c. Design an accessory sheath of insulating material to be worn on the tentacle when they anticipate being around live power sources.
    d. Make the tentacle out of a non-conductive material.

15. A primary difference between a task list and a Gantt chart is that:
    a. a Gantt chart is intended for a client, while a task list is an internal document.
    b. a Gantt chart shows the timing interactions, while a task list does not.
    c. a Gantt chart is a static snapshot, while a task list is a living document that must be continually updated.
    d. a Gantt chart is created at the end of a project to summarize the work done, while a task list is created at the start of a project for planning purposes.

16. Which of the following statements about brainstorming is **NOT** correct?
    a. All participants in brainstorming should be given a chance to contribute to the process.
    b. Brainstorming is often used for creative problem solving.
    c. Brainstorming is an open game without rules or guidelines.
    d. No criticism is allowed in brainstorming.

17. Functional fixedness is a cognitive obstacle to innovation. Which statement does **NOT** provide an example of breaking out of functional fixedness?
    a. I used a coin to tighten a loose screw in my desk
    b. My little sister drew all over the wall
    c. I used salt to remove ice from my driveway
    d. I turned my fishing lure into earrings

18. A Dimensional Analysis is used to:
    a. estimate the size of an object
    b. estimate the mass of an object
    c. to create relationships where all the units cancel properly
    d. to create a conceptual design

19. One way to generate new ideas is to look at how the function is accomplished in other industries. This is an example of:
    a. Industrial thinking
    b. Blue sky thinking
    c. TRIZ
    d. Design by analogy

20. TRIZ is a theory of design that:
    a. Is named after the Russian for “Substitute, Combine, Reduce, Invent”
    b. Describes the use of analogies such as the Fantasy Analogy
    c. Uses a large but finite number of inventive principles to address new problems
    d. Describes a means of classifying design objectives