

Engineering Strategies and Practice

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

Quiz #2 April 11, 2017

This is a 50-minute quiz. The quiz is closed book and closed notes. The quiz has a total of 32 questions, worth 47 marks. The questions are divided between two booklets.

Question Booklet #1 – Multiple Choice Question Booklet

This booklet contains 29 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
- **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.

Questions 1 to 4 pertain to Figure 1:

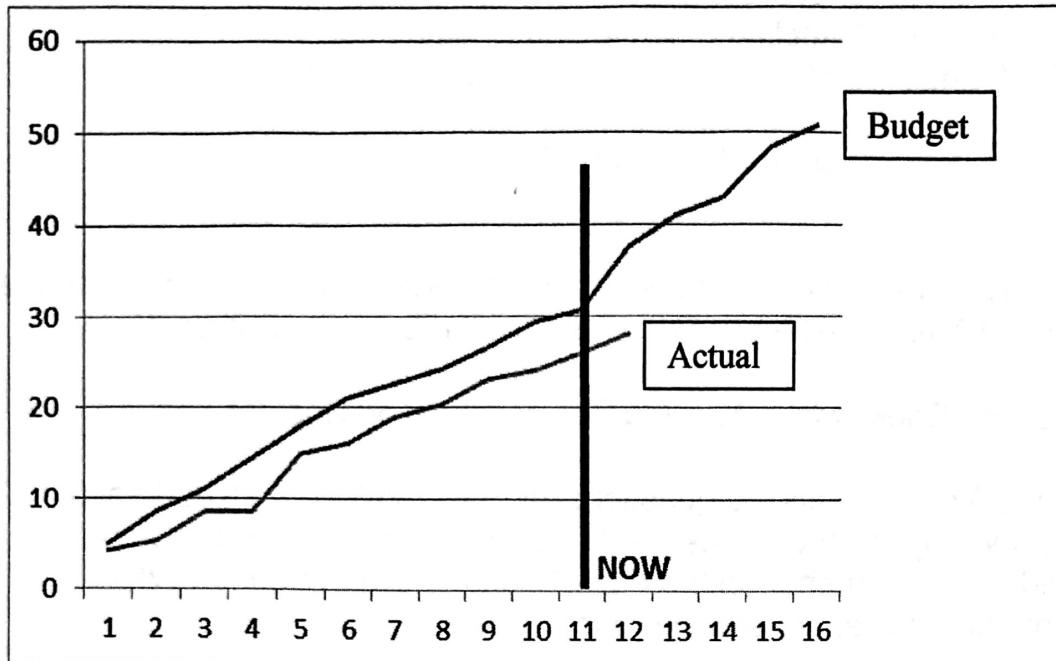


Figure 1: Time (x axis) versus Cost (y axis)

The longer line on the chart is the budgeted costs as the project goes through the proposed schedule of tasks, the shorter line tracks the costs that have been incurred as the tasks have been completed. **NOW** indicates the place the proposed schedule indicates the project should be.

1. The project is:
 - a. On time, over budget
 - b. Behind time, over budget
 - c. Ahead of time, under budget
 - d. Behind time, under budget

2. The Actual Cost of Work Performed would be closest to:
 - a. 52
 - b. 31
 - c. 28
 - d. 25

3. The Schedule Variance would be closest to:
 - a. -6
 - b. -4
 - c. -15%
 - d. A positive number

4. If I'm concerned about the costs of a project at a point in time, relative to the expected costs of the project, I would look at:
 - a. BCWP
 - b. ACWP
 - c. Cost Variance
 - d. Cost Performance Index
5. Which of these is a risk associated with airline travel?
 - a. Getting hit by a car in the airport parking lot
 - b. Being delayed and missing a flight
 - c. Being on a flight that crashes
 - d. All of the above
6. A project is "Fast Tracked". Which activity would definitely be involved?
 - a. Delaying parts of the design until "just in time" as the project went into execution
 - b. Hiring extra workers
 - c. Carefully designing tasks to take the shortest time possible
 - d. Reducing the time on the critical path
7. A student may be in violation of the Code of Academic Misconduct at the University of Toronto if, for their Final Design Specification, they:
 - a. Reuse content from their PR and for which they previously received marks
 - b. Use the idea of another person citing the original source
 - c. Use another persons' expression of an idea only citing the original source
 - d. Submit the assignment more than three days late
8. The primary purpose of the Design Review Gateway is to:
 - a. Document the current status of the report
 - b. Persuade the audience that you should proceed with your recommended design
 - c. Give a detailed explanation of your recommended design
 - d. Give a detailed explanation of the alternative designs you considered
9. The important difference between a Pugh Selection Matrix and a Weighted Decision Matrix is:
 - a. One is rational, the other is not
 - b. One is named after the inventor, the other is not
 - c. One is relative while the other is absolute
 - d. One is a pairwise comparison, while the other is not

10. One way to modify a Pugh Selection Matrix to address a key limitation is to:
- Use weighted objectives
 - Generate more alternative designs
 - Generate the Pugh Selection Matrix multiple times to identify errors
 - Reduce the number of alternative designs to two before using
11. The primary purpose of the Final Design Specification is to:
- Persuade the client of the appropriateness of the recommended design
 - Conduct a preliminary risk assessment
 - Establish precedence to allow for future patents
 - Supply the client with the information needed to implement the design
12. When ordering parts for an electronic design project you specify the resistors to be "100 Ω +/- 1%." This is because as an engineer you recognize that the practical world is:
- Probabilistic
 - Deterministic
 - Realistic
 - Homogeneous
13. Drafters generally prefer to use _____ drawings to help illustrate 3-dimensional views of a structure.
- isometric
 - perspective
 - orthographic
 - auxiliary
14. In perspective drawings, _____ is placed between the observer and the object:
- Vanishing point / horizon
 - Station point
 - Ground line
 - Plane of projection / picture plane
15. The reliability of an operation is normally **NOT** improved by which one of the following procedures?
- Designing out fail points in the operation.
 - Laying off employees who cause faults in the operation.
 - Ensuring some activities in the operation are 'fail-safe'.
 - Building redundancy into the operation.

16. The 'bath-tub' curve indicates failure probability. Which stage is **NOT** normally associated with the bathtub curve?
- 'Normal-life' where few failures occur.
 - 'Pulling the plug' where production is halted due to unacceptable level of failures.
 - 'Wear-out' where failure increases due to age.
 - 'Infant-mortality' where failures occur early.

17. Twelve new bedside monitors are installed in an intensive care unit at a hospital. One system failed the minute it was switched on and another failed after 72 hours of use. If the other ten monitors worked flawlessly for a week, what is the MTBF? Recall the definition of MTBF:

Reliability is quantified as Mean Time Between Failures (MTBF).

The MTBF can be calculated as the arithmetic mean (average) time between failures of a system.

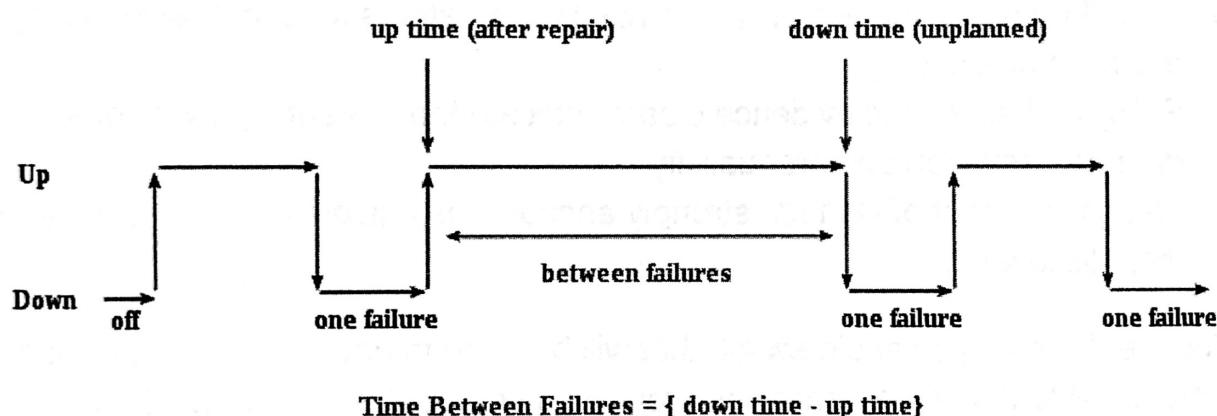


Figure 2: Mean Time Between Failures [Source: Wikimedia commons]

$$MTBF = \frac{\sum (\text{start of downtime} - \text{start of uptime})}{\text{number of failures}}$$

- 632 hours
- 1752 hours
- 749 hours
- 876 hours

18. If you invent a new process for recording music, you might apply for a:
- Patent
 - Trademark
 - Copyright
 - Industrial design
19. The rights of an author or artist with respect to his or her creation are governed by the law of:
- Patents
 - Copyrights
 - Trademarks
 - Industrial designs
20. Which statement is **FALSE**?
- Filing, translating and maintaining a patent across multiple key regions may cost hundreds of thousands of dollars.
 - Canada ranks competitively in the number of patents filed, but ranks poorly in business productivity.
 - Policy and economic evidence clearly indicate that patenting inventions leads to greater innovation and productivity.
 - The government of Canada strongly encourages university researchers to patent their discoveries.
21. You are designing solenoid switch that will be used to deploy photovoltaic panels on a probe set to land on a nearby asteroid. You should design the switch to:
- Have a redundant power supply (Design for Reliability)
 - Have a fire suppression system in case of battery explosion (Design for Safety)
 - Use a standard battery size (Design for Maintainability)
 - All of the above
22. KPR is a memory device for workers' rights in Ontario. Workers have the right to:
- Know, Protection, Registration
 - Know, Participate, Refuse
 - Keep, Protection, Run
 - Keep Out, Participation, Release

23. Workers have the responsibility to:

- a. Wear protective devices prescribed
- b. Use equipment, devices, or clothing required by employer
- c. Report all defects to the supervisor
- d. All of the above.

Questions 24 to 29 pertain to Case Study #1.

Case study #1: Steam Whistle Brewery

In 2006, after only 8 years of operation, the Steam Whistle Brewery found that it was so successful that it had to increase its output. In order to do so, the company required a new brew house. A "brew house" is a system of equipment required to brew beer. Normally, this equipment is contained in a long building because part of the process requires the liquid to travel through a cooled pipe in order to reduce its temperature after the heating process in the brew kettle. However, a complication for the installation of the new brew house was that the brewery's home is a round heritage building and they are not allowed to make any structural changes to the outside of it. However, they chose this site because its location allows them to play an active role in the life of the community hosting art shows and community events.

24. The functional basis for this design is:

- a. Transform mass
- b. Increase capacity
- c. Maintain energy
- d. Allow information

25. A primary function for this design is:

- a. Must keep up with customer demand
- b. Improve community spirit
- c. Produce 90,000 hectoliters of beer annually
- d. Build a new brew house

26. A secondary function for this design is:

- a. Increase profits of Steam Whistle Brewery
- b. Remove heat energy from liquid exiting the brew kettle
- c. Be environmentally responsible
- d. Put the beer in bottles

27. For this design, an objective and its corresponding goal would be:

- a. Increase production – goal 90,000 hectoliters of beer annually
- b. Change the structure of the brew house – add cooling pipes
- c. Inexpensive – does not reduce profits of the company
- d. Efficient in use of resources – reduce waste water by 1/3

28. For this design, the best stakeholder, with corresponding interest, for the Project Requirements would be:

- a. Toronto Heritage Services – interest: to preserve historic architecture in the city
- b. Steam Whistle Brewery – interest: increasing sales and profits
- c. Nearby residents – interest: reduce noise during construction of new brew house
- d. Other breweries – interest: new brewhouse may reduce their sales and profits

29. For Client's Ethics and Values, the team should write: The company is interested in:

- a. Increasing its reputation by increasing sales across the country
- b. Reduce costs by not building a whole new building, but remaining in their current location
- c. Maintaining a profile as a member of the local community as more than a brewery or small business
- d. Increasing viability of the company so that it would be desirable for a take-over by a larger brewery