

1. (10 Points) Select all correct answers for each of the following questions.

1) Given the following Java method, which of the following input(s) can reveal the fault in the method?

```
public int countEven(int[] a) {  
    int count = 0;  
  
    if (a.length!=0 && a!=null) {  
        for (int i=0; i<a.length; i++) {  
            if (a[i]%2 == 0) {  
                count++;  
            }  
        }  
    }  
    return count;  
}
```

- a) null
- b) {}
- c) {0}
- d) {1, 0}

Answer:

a

2) For the method in 1.1, which of the following input(s) should be used for black box testing?

- a) A very large array with mixed even and odd numbers
- b) {2, 2, 2, ,2, 2}
- c) {3}
- d) {}
- e) null

Answer:

a, b, c, d, e

3) Among the following version control systems, which is (are) distributed?

- a) CVS
- b) Subversion
- c) Git
- d) Mercurial

Answer:

c, d

4) Which of the following indicate(s) potential problems of a module?

- a) Long method
- b) Low cohesion
- c) Low coupling to other modules
- d) Low cyclomatic complexity

Answer:

a, b

5) Which of the following can impact project scheduling?

- a) Units used
- b) Task dependencies
- c) personnel capabilities
- d) Effort required

Answer:

a, b, c, d

2. (20 Points) Mark the following statements True or False.

True / False	Statement
False	Burns charts are often used for project tracking with tradition development processes.
False	Git uses centralized repository.
True	Git allows multiple people to check out the same file at the same time.
False	Conducting software validation does not require executing the software.
False	According to IEEE standard definition for fault and failure, a fault always leads to failure
False	Alpha testing is conducted at a customer's site.
False	When writing unit tests, we should always make sure they provide 100% path coverage.
True	It is not always possible to use debugger to debug a production environment.
False	With traditional software development approach, system testing often happens early in the process.
False	Static analysis is the manual verification of software without executing it.

3. (5 Points) What are the four types of maintenance?

Answer:

Corrective maintenance, preventive maintenance, adaptive maintenance, and perfective maintenance

4. (5 Points) Regarding quality assurance, what does validation and verification mean?

Answer:

Validation is the process of determining if a product satisfies the specified business requirements.

Verification is the process of determining if a product is built according to the requirements and design specifications.

5. (5 Points) Regarding defect elimination, list 5 defect prevention techniques?

Answer:

Any 5 items from the following:

- Process guides
- Analysis and design methods
- Reference architectures
- Design patterns
- Standard data structure and algorithms
- Software reuse
- Prototyping
- Version control
- Configuration management
- CASE tools
- Training and education

6. (5 Points) What is Brook's law? What is the reasoning behind it?

Answer:

Brooks' Law states that adding programmers to a late project makes it later. The reasoning behind it is that when new programmers are added to a late project, some existing programmers need to spend time training new programmers and cannot work on the project full time. Before those new programmers can make real contribution to the project, the actual number of people can work on the project is reduced. Thus, can make a late project even later.

7. (5 Points) With agile development approach, describe how is project duration determined for a feature-driven project.

Answer:

A feature-drive project has a set of required features defined. User stories should be written for those features, and estimates should be made for each of those user stories. The team should agree on a sprint length, then expected velocity should be determined by using historical data or other methods. **Total user story points divide by expected velocity gives us the number of sprints required**, which can be mapped to days or months using sprint length.

8. (5 Points) Given a project at the current time, the earned value is 89, planned value is 83, and actual cost is 95. Answer the following questions:

- At the current time, what is the schedule performance index?
- At the current time, is the project on schedule, behind schedule, or ahead of schedule?
- At the current time, what is the cost performance index?
- At the current time, is the project on budget, over budget, or under budget?

Answer:

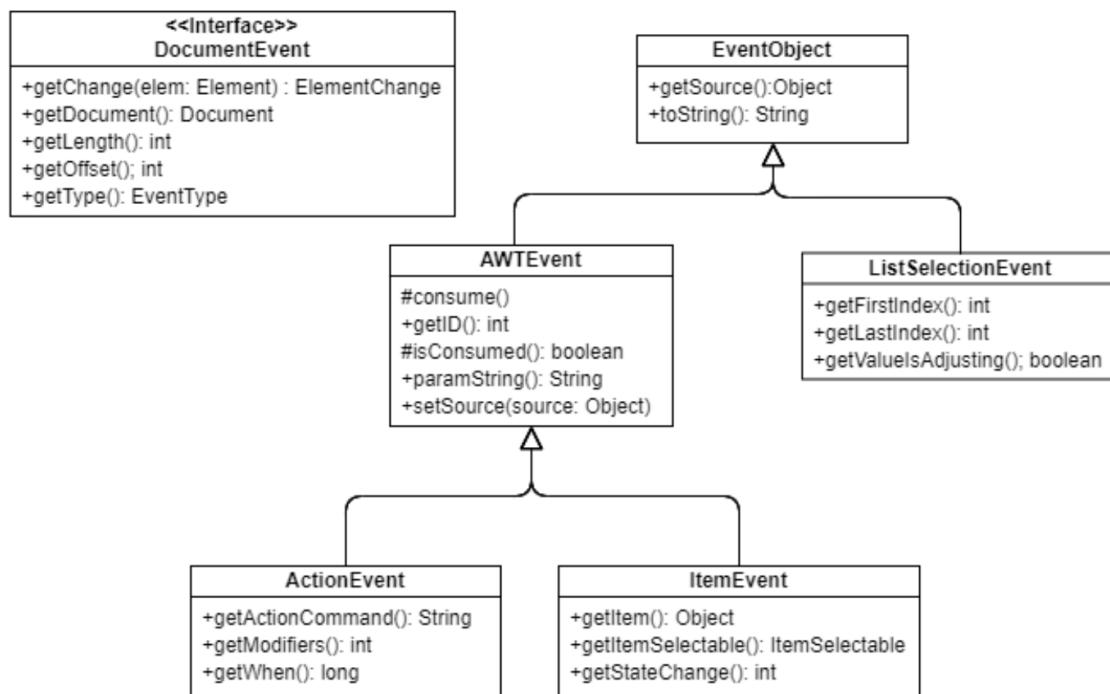
a) schedule performance index = earned value / planned value = $89 / 83 = 1.07$

b) The project is ahead of schedule because schedule performance index is greater than 1.

c) cost performance index = earned value / actual cost = $89 / 95 = 0.94$

d) The project is over budget because cost performance index is less than 1.

9. (10 Points) Given the following class diagram, assuming it provides all non-private methods for each class, answer the following questions by using this reference: https://en.wikipedia.org/wiki/Class_diagram:



- What is relationship between AWTEvent and EventObject?
- For AWTEvent, how many methods have public visibility?
- For AWTEvent, how many methods have protected visibility?
- For AWTEvent, how many methods have package visibility?

Answer:

a) inheritance, b) 3 (or 5 considering inherited methods), c) 2, d) 0

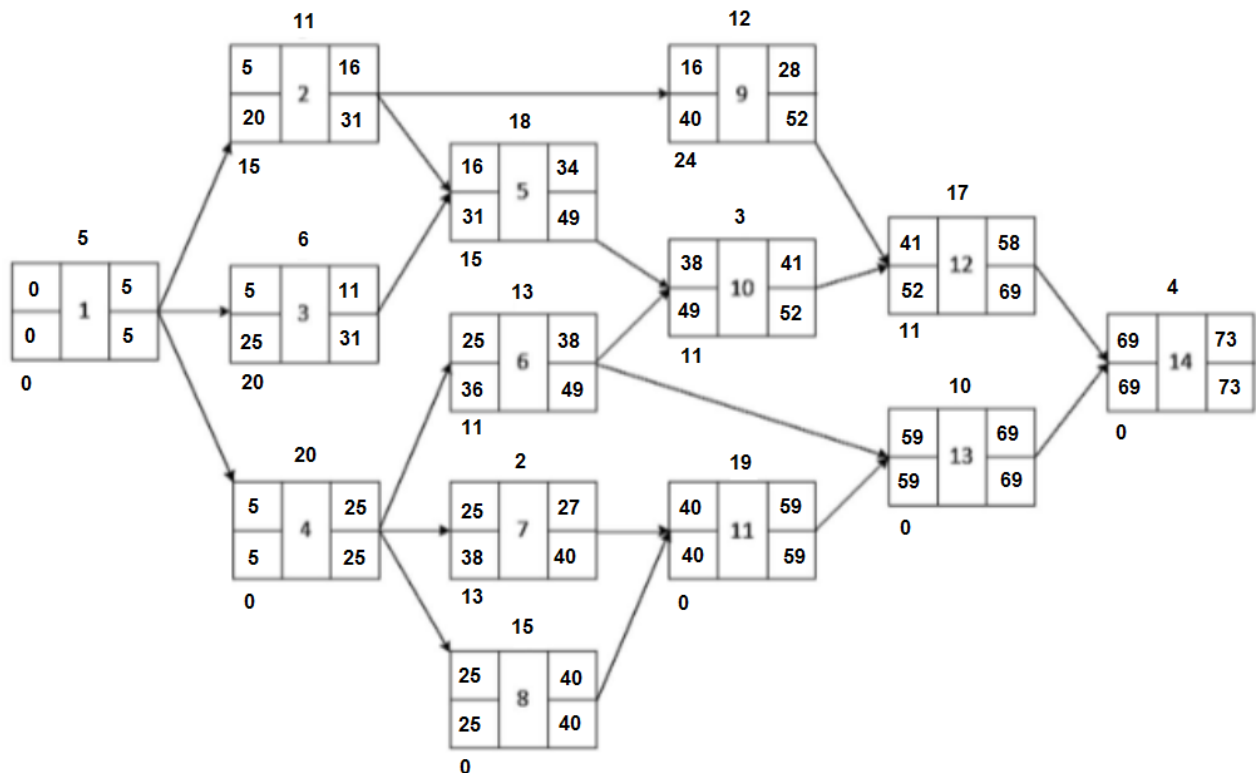
10. (10 Points) Given tasks, task durations, and task dependencies in the table

a) fill the drawing using Critical Path Method.

b) provide the critical path.

Task Number	Duration	Prerequisite Tasks
1	5	
2	11	1
3	6	1
4	20	1
5	18	2, 3
6	13	4
7	2	4
8	15	4
9	12	2
10	3	5, 6
11	19	7, 8
12	17	9, 10
13	10	6, 11
14	4	12, 13

Answer: a) see graph below, b) The critical path is 1->4->8->11->13->14



11. (10 Points) Given the following Java method, answer the following questions using the definition presented in class slides. Note that coverage report from EclEmma has slightly different definitions.

```
public static int foo(int x, int y) {  
    int t = 5;  
    if (x > 1 || y == 1) {  
        t = x - y;  
    }  
    int z = t * 2;  
    return z;  
}
```

a) Provide a test suite with minimum number of test cases that provides 100% statement coverage.

Answer: The following test suite consists one test case

{x=2, y=0}

b) Provide a test suite with minimum number of test cases that provide 100% branch coverage.

Answer: The following test suite consists two test cases

{x=2, y=0}, {x=0, y=0}

c) Provide a test suite with minimum number of test cases that provide 100% condition coverage for if statement.

Answer: The following test suite consists two test cases

{x=2, y=0}, {x=0, y=1}

d) Provide a test suite with minimum number of test cases that provide 100% multiple condition coverage for if statement.

Answer: The following test suite consists three test cases, assuming short circuit evaluation is used

{x=0, y=0}, {x=0, y=1}, {x=2, y=0}

12. (10 Points) Using ISO/IEC 25010 quality model, <https://iso25000.com/index.php/en/iso-25000-standards/iso-25010?limit=3&limitstart=0>, find the best 1-1 match between items in column A and column B.

A	B
1) Functional Suitability	a) User error prevention
2) Performance Efficiency	b) Interoperability
3) Compatibility	c) Fault tolerance
4) Usability	d) Installability
5) Reliability	e) Authenticity
6) Security	f) Testability
7) Maintainability	g) Resource utilization
8) Portability	h) Functional completeness

Answer:

1-h, 2-g, 3-b, 4-a, 5-c, 6-e, 7-f, 8-d

Submission Note

1) For written part of the questions:

- Write your answers inside a text document (in plain text, MS Word, or PDF format)
- Name the file as CSC131.firstname.lastname.assignment3.txt(doc, docx, or pdf) with proper file extension

2) Due Dec 2nd, 11:59 PM