

Chapter 15

Software Engineering

1. Software engineering primarily aims on developing
 - (a) reliable software
 - (b) cost effective software
 - (c) reliable and cost effective software
 - (d) none of the above
2. A good specification should be
 - (a) unambiguous
 - (b) distinctly specific
 - (c) functional
 - (d) none of the above
3. Which of the following is a tool in design phase?
 - (a) Abstraction
 - (b) Refinement
 - (c) Information hiding
 - (d) None of the above
4. Information hiding is to hide from user, details
 - (a) that are relevant to him
 - (b) that are not relevant to him
 - (c) that may be maliciously handled by him
 - (d) that are confidential
5. Which of the following comments about object oriented design of software, is not true?
 - (a) Objects inherit the properties of the class
 - (b) Classes are defined based on the attributes of objects
 - (c) An object can belong to two classes
 - (d) Classes are always different
6. Design phase includes
 - (a) data, architectural and procedural designs only
 - (b) architectural, procedural and interface designs only

- (c) data, architectural and interface designs only
- (d) data, architectural, interface and procedural designs

The next 5 questions are based on the information furnished below.

In a particular program, it is found that 1% of the code accounts for 50% of the execution time. To code the program in FORTRAN, it takes 100 man-days. Coding in assembly language is 10 times harder than coding in FORTRAN, but runs 5 times faster. Converting an existing FORTRAN program to an assembly language program is 4 times harder.

- *7. To completely write the program in FORTRAN and rewrite the 1% code in assembly language, if a project team needs 13 days, the team consists of
 - (a) 13 programmers
 - (b) 10 programmers
 - (c) 8 programmers
 - (d) 100/13 programmers
- *8. If 99% of the program is written in FORTRAN and the remaining 1% in assembly language, the percentage increase in the programming time compared to writing the entire program in FORTRAN and rewriting the 1% in assembly language is
 - (a) 10
 - (b) 5
 - (c) 13
 - (d) 8
- *9. If the entire program is written in FORTRAN, the percentage increase in the execution time, compared to writing the entire program in FORTRAN and rewriting the 1% in assembly language is
 - (a) 0.9
 - (b) 8
 - (c) 0.8
 - (d) 9
- *10. If 99% of the program is written in FORTRAN and the remaining 1% in assembly language, the percentage increase in the execution time, compared to writing the entire program in FORTRAN and rewriting the 1% in assembly language is
 - (a) 0.9
 - (b) 1
 - (c) 0.1
 - (d) 0
- *11. If a weightage of 3 is given to the programmers effort and a weightage of 2 is given to the execution time, then coding 99% in FORTRAN and the 1% in assembly language performs better than coding in FORTRAN completely and rewriting the 1% in assembly language by a factor of about
 - (a) 1.5
 - (b) 1.2
 - (c) 1.1
 - (d) it does not perform better
- 12. Data structure suitable for the application is discussed in
 - (a) data design
 - (b) architectural design
 - (c) procedural design
 - (d) interface design
- 13. Design phase will usually be
 - (a) top-down
 - (b) bottom-up
 - (c) random
 - (d) centre fringing
- 14. Assertions are conditions which are true at the point of execution
 - (a) always
 - (b) sometimes
 - (c) many times
 - (d) no time
- 15. Assuming the existence of a start and end nodes for a program graph, the total number of paths is equivalent to the set of test data required to test the software.
 - (a) minimum
 - (b) maximum
 - (c) optimum
 - (d) supremum

- *16. Let M be a node that represents a `if-then-else` node in a Program Graph. Let the number of paths from its `if` part to the `end` node is y , and from the `else` part to the `end` node is z . If the number of paths from the `start` node to the node M is x , then the total number of paths through M is
- (a) $xy + z$ (b) $xz + y$ (c) $x + y + z$ (d) $x(y + z)$
17. If X is a case statement in a Program Graph with n cases instead of an `if-then-else` statement in the previous question with each case leading to only one path to `end` node, total number of paths through X is
- (a) $x + n$ (b) x^n (c) $x \log(n)$ (d) xn
18. Structured programming codes include
- (a) sequencing (b) alteration
(c) iteration (d) multiple exit from loops
19. Which of the following is a desirable property of a module?
- (a) Independency (b) Low cohesiveness (c) High coupling (d) Multi functional
20. Which of the following types of maintenance takes the maximum chunk of the total maintenance effort in a typical life cycle of a software product?
- (a) Adaptive maintenance (b) Corrective maintenance
(c) Preventive maintenance (d) Perfective maintenance
21. An important aspect in coding is
- (a) readability (b) productivity
(c) to use as small a memory space as possible (d) brevity
22. One way to improve readability in coding is to
- (a) avoid `goto` statements
(b) name variables and functions according to their use
(c) modularize the program
(d) none of the above
23. The data flow model of an application mainly shows
- (a) the underlying data and the relationship among them
(b) processing requirements and the flow of data
(c) decision and control information
(d) communication network structure
24. According to Brooks, if n is the number of programmers in a project team then the number of communication paths is
- (a) $n(n-1) / 2$ (b) $n \log n$ (c) n (d) $n(n+1) / 2$
25. The extent to which the software can continue to operate correctly despite the introduction of invalid input is called as
- (a) reliability (b) robustness (c) fault-tolerance (d) portability
26. If the number of conditions in a decision table is n , the maximum number of rules (columns) possible is
- (a) n (b) $2n$ (c) 2^n (d) $\log_2 n$

37. Which of the following software engineering concept does Ada language support?
 (a) Abstraction (b) Generic
 (c) Information hiding (d) None of the above
- *38. In unit testing of a module, it is found that for a set of test data, at the maximum 90% of the code alone were tested with the probability of success 0.9. The reliability of the module is
 (a) greater than 0.9 (b) equal to 0.9
 (c) at most 0.81 (d) at least $1/0.81$
39. Which of the following testing methods is normally used as the acceptance test for a software system?
 (a) Regression testing (b) Integration testing
 (c) Unit testing (d) Functional testing
40. A computer program can often be a very satisfactory of a physical system such as road traffic conditions.
 (a) solution (b) replacement (c) simulation (d) model
41. `for(i = 0, s = 0; i < n; i++) s += a [i];`
 The symbolic execution with $n = 3$ at $i = 2$, s is
 (a) $a_0 + a_1 + a_2 + a_3$ (b) $a_0 + a_1 + a_2$
 (c) $a_0 + a_1$ (d) $a_0 + a_1 + a_3$
- *42. On an average, the programmer months is given by $3.6 \times (\text{KDSI})^{1.2}$. If so, a project requiring one thousand source instructions will require
 (a) 3.6 PM (b) 0.36 PM (c) 0.0036 PM (d) 7.23 PM
43. Software testing techniques are most effective if applied immediately after
 (a) requirement specification (b) design
 (c) coding (d) integration
44. Consider the following code for finding the factorial of a given positive integer.

```

IFACT = 1
DO 100 I = 2, N, 2
100 IFACT = IFACT * I * (I-1)

```

 For which values of N , the above FORTRAN code doesn't work?
 (a) N is even (b) N is odd
 (c) N is perfect number (d) $N \bmod 3 = 0$
45. For the above code, using symbolic execution, after the iteration with $N = 5$, $IFACT$ is
 (a) $1 * 1 * 2 * 3 * 4 * 5$ (b) $1 * 2 * 3 * 4 * 5$
 (c) $1 * 1 * 2 * 3 * 4$ (d) $1 * 2 * 3 * 4$
46. Which of the following is not an assertion?
 (a) P is true, P and Q are true and K or not (Q) is true implies K is true.
 (b) P is true, P and Q are true and K or not (Q) is true implies K is true.
 (c) P is true, P and Q are false and K or Q is true implies K is true.
 (d) P is true, P and Q are true and K or not (K) is true implies K is true.

47. The reliability of a program be 0.8. The reliability of an equivalent program (ie., another program that serves the same purpose) is 0.9. The probability that both the programs give the wrong result for the same input is
 (a) 0.72 (b) 1.7 (c) 0.1 (d) 0.02
48. The program volume of a source code that has 10 operators including 6 unique operators, and 6 operands including 2 unique operands is
 (a) 48 (b) 120 (c) 720 (d) insufficient data
- *49. To increase reliability, fault tolerance is included in the system in the form of multiple modules. If the problem can be solved by 5 different modules, each with probability of success 0.7, the probability that it can be solved even if 4 modules fail is approximately
 (a) 0.3 (b) 0.03 (c) 0.49 (d) 0.05
50. In object-oriented design of software, objects have
 (a) attributes and name only (b) operations and name only
 (c) attributes, name and operations (d) none of the above

Answers

- | | | | | |
|-------|-------------|-------------|-------|-------|
| 1. c | 2. a, b, c | 3. a, b, c | 4. c | 5. c |
| 6. d | 7. c | 8. b | 9. c | 10. d |
| 11. d | 12. a | 13. a | 14. a | 15. a |
| 16. d | 17. d | 18. a, b, c | 19. a | 20. d |
| 21. a | 22. a, b, c | 23. b | 24. a | 25. b |
| 26. c | 27. a, b, c | 28. b | 29. c | 30. d |
| 31. b | 32. a | 33. d | 34. c | 35. a |
| 36. a | 37. a, b, c | 38. c | 39. d | 40. c |
| 41. b | 42. a | 43. b | 44. b | 45. c |
| 46. d | 47. d | 48. a | 49. b | 50. c |

Explanations

7. Writing the whole program in FORTRAN takes 100 man-days. Rewriting the 1% code takes 4 man-days. Altogether 104 man-days. If it is completed in 13 days, $104/13 = 8$ men should be involved.
8. The first case takes $99 + 10 = 109$ man-days. The second case takes $100 + 4 = 104$ man-days. The required percentage is $(109 - 104) \times 100/100 = 5$.
9. Let the first case takes 100 units of time to execute. The second case will take $99 + (1/5)$ units of time, as coding the 1% in assembly language will take $1/5$ units of time. Hence the required percentage is $0.8 \times 100/100 = 0.8$.
10. In both the cases, the final program will have the same 99% of the code in FORTRAN and the remaining 1% in assembly language. Hence the execution time will remain the same.
11. The first case has a measure of $((3 \times 109) + 2 \times (99 + 1/5))/5$ and the second $((3 \times 104) + 2 \times (99 + 1/5))/5$. Lower the measure, the more preferable it is.