Chapter 1 Process Life Cycle

Hints/Solutions

Practice Problems 1

5. Data flow diagram, regular expression and transition table can be combined to provide finite state automata for functional specification of system software.

Hence, the correct option is (B)

6. Software configuration management tool helps in maintaining different versions of the configurable items.

Hence, the correct option is (C)

7. Payback period is the amount of time needed to get back the invested amount in simple playback method. It is calculated as:

$$\text{Payback period} = \frac{\text{Amount invested}}{\text{Benefits per month}}$$

$$\text{i.e., pay back period} = \frac{250,000}{30,000}$$

$$= 8.33 \text{ months.}$$

Hence, the correct option is (B)

13. In the above decision tables, all the rules are not specified, so the decision table is incomplete. [Decision table should be complete otherwise it leads to specific errors]

Hence, the correct option is (C)

Previous Years' Questions

1. Requirements capture–Domain analysis design–Structural and behavioural modelling.

Implementation–Module development and integration.

Maintenance–Performance tuning

Hence, the correct option is (B)

2. In a good software requirement specification, algorithms for software implementation is NOT desired.

Hence, the correct option is (D)

CHAPTER 2 PROJECT MANAGEMENT AND MAINTENANCE

HINTS/SOLUTIONS

Practice Problems I

1. Given weight table:

	Simple	Average	Complex
Number of inputs	3	(4)	6
Number of outputs	4	(5)	7
Number of enquiries	3	4	(6)
Number of files	7	(10)	15
Number of interfaces	5	(7)	10

Number of inputs is: 1*4 = 4

Number of outputs is: 1 pay slip, 3 reports (earning, deduction and coin age analysis) 3 error messages:

$\cong 7*5 = 35$

Number of enquiries interactive command = 1*6 = 6

Number of interfaces = 1*7 = 7

Unadjusted function point $= \sum_{i=1}^{5} w_i p_i$

wi = weight selected for ith FP

$pi = i$th FP

So unadjusted $FP = 62$

Hence, the correct option is (B).

2. Adjusted FP = Unadjusted $FP\left(0.65 + .01 * \sum_{i=1}^{4} Fi\right)$

$= 62 * [0.65 + 0.01 * (4 + 3 + 2 + 5)]$

$= 62 * (0.65 + 0.14)$

$= 49$

Hence, the correct option is (A).

3. Code size = 45 KLOC

For organic type of projects (i.e., application type),

Effort = $2.4\ (45)^{1.05}$ PM

$= 130$ PM

Hence, the correct option is (C).

4. Code size = 45 KLOC

Cost = ₹20,000

For system programming type of projects (semi-detached) the effort = $3.0\ (45)^{1.12}$ PM

= 213 PM

Time = $2.5 \times (213)^{0.35} = 16.3$ months

Cost = 16.3 * 20,000

= 3,26,515

Hence, the correct option is (D).

5. Effort = 3.6 * $(40)^{1.2}$ PM

= 301 PM

Time = $C^*(E)^d$ months

$= 2.5\ (301)^{0.32}$ months

= 15.53 PM

$\cong$ 16 PM

Hence, the correct option is (C).

6. In a branch coverage testing each branch has to be tested. Therefore in given example the test data will be values of x which are ≤ 0 or > 0.

$\therefore \quad x = 0, x = 4$ is answer.

Hence, the correct option is (A).

7. Maintainability = 0.2 (average number of days repairing code) + 0.25 (average number of days adapting code) + (0.55* of days of enhancing code)

$= 0.2 \times 10 + 0.25 \times 20 + 0.55 \times 10 = 12.5$

Hence, the correct option is (B).

8. The modularity of the class is given by

$$M_{\text{class}} = \frac{\text{Number of methods per class}}{\text{Number of source lines of code}}$$

$$= \frac{3}{1000}$$

$$= 0.003$$

Hence, the correct option is (C).

9. The exhaustive search starts with an internal representation of the parameters. Therefore for 32-bit representation of 2 input values, are there a and b each input produces 2^{32} test cases.

$\therefore \quad 2^{32} * 2^{32} = 2^{64}$

Hence, the correct option is (D).

10. Info flow = length * (fan – in * fan – out)^2

Info flow of module $L = L(5 \times 3)^2$

Info flow of module $1 = \frac{L}{2}(5 \times x)^2$

$\therefore$ To find the allowance of links:

$$L(5 \times 3)^2 = \frac{L}{2}(5 \times x)^2 + \frac{L}{2}(x \times 3)^2$$

$\Rightarrow \quad x = 3.6$

Hence, the correct option is (B).

11. $\text{Estimate} = \frac{\text{Opt} + 4 * \text{most likely} + \text{pessimistic}}{6}$

$$= \frac{4600 + 4 \times 6900 + 8600}{6}.$$

= 6800

Hence, the correct option is (B).

12. An application for developing a new OS is a semidetached system.

$\text{Effort}_{\text{nom}} = 3 * (\text{KLOC})^{1.12} = 147.7 \approx 158$

Hence, the correct option is (C).

13. A real-time software is an embedded system

$\therefore$ Effort = $3.6 * (\text{KLOC})^{1.20}$

$= 3.6 * (28.2)^{1.20}$

$= 197.9 \approx 198$

Hence, the correct option is (B).

14. An inventory management system is semi-detached.

$\therefore$ Effort = $3.0 * (25.5)^{1.12}$

$= 112.8 \cong 113$

Hence, the correct option is (B).

15. Development schedule 1 duration is

$M = 2.5 * (\text{EFFORT})^{0.35}$

$= 2.5 * (113)^{0.35} = 13$ months

Hence, the correct option is (D).

Practice Problems 2

1. path to Node 9: {1, 2, 3, 2, 4, ,5 6, 7, 9}

{1, 2, 4, 5, 6, 7, 9 }

{1, 2, 3, 2, 4, 6, 7, 9 }

{1, 2, 4, 6, 7, 9}

Number of paths to node 9 = 4

Hence, the correct option is (C).

2. Total number of paths is 28.

The number of nodes is 10.

$\therefore$ The reachability is $\frac{28}{10} = 2.8$

Hence, the correct option is (B).

3. An estimate is calculated as

$$\frac{\text{pessimistic} + 4 * \text{Most likely} + \text{optimistic}}{6}$$

$\therefore$ Average estimate is $\frac{48.3 + 50.8 + 48.3 + 56.7 + 43.3}{5}$

$= 49.4$

Hence, the correct option is (B).

4. Variance =

$$\frac{\text{upper bound of estimate} - \text{lower bound of estimate}}{6}$$

$\therefore$ Average variance is $\frac{5.0 + 10.8 + 8.3 + 6.7 + 8.3}{5} = 7.8$

Hence, the correct option is (C).

5. Information flow = length (fan-in * fan-out)^2

For Module 'L' it is

$L(4 \times 3)^2$

For module 1 it is

$L/2\ (3 \times x^2)$

For module 2 it is $L/2\ (x \times 4)^2$

$L(3 \times 4)^2 = \frac{L}{2}(3 \times x)^2 + \frac{L}{2}(x \times 4)$

$x = 3.39 \cong 4$

Hence, the correct option is (B).

6. In software projects, constructive cost model is much to estimate the effort in man-month and the maintenance effort.

Hence, the correct option is (A).

8. Functional testing is normally used as the acceptance test for a software system.

Hence, the correct option is (D).

9. Acceptance testing is running system with line data by the actual user.

Hence, the correct option is (B).

11. Code size = 40 KLOC.

For organic type of project,

Effort = $2.4\ (\text{KLOC})^{1.05}$ OM

$= 2.4\ (40)^{1.05}$ PM

$= 115$ PM

Time = $2.5 \times (115)^{0.38}$

$= 15$ months

Cost = 15×1500

$= 2,25,000.$

Hence, the correct option is (D).

12. Code size = 35 KLOC

Cost = ₹25,000

For semidetached system programming type of project,

Effort = $3.\ 0\ (\text{KLOC})^{1.12}$ PM

$= 3.0(35)^{1.12}$ PM

$= 160.87$ PM

Time = $2.5 \times (160.87)^{0.35}$

$= 15$

Cost = effort × cost PM

$= 15 \times 25,\ 000$

$= 369952.$

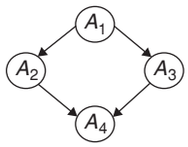
Hence, the correct option is (C).

15. A sequence of activities that take the longest time to complete is called critical path. The length of the critical path defines how long your project will take to complete.

$\therefore$ The critical path of the software project is $A_1 - A_3 - A_4$.

Hence, the correct option is (B).

16. Figure below shows the dependency graph of the software project.



Forward path analysis:

Activity	Earliest state (ES)	Earliest finish (EF)
A_1	1	11
A_2	12	18
A_3	12	19
A_4	20	22

Backward path analysis:

Activity	Latest state (LS)	Latest finish (LF)
A_1	1	11
A_2	13	19
A_3	12	19
A_4	20	22

Slack time of an activity A:

$ST_A = LS_A - ES_A$ $\quad ST_{A2} = 13 - 12 = 1$

Hence, the correct option is (B).

Previous Years' Questions

1. Coupling indicates the strength of interconnections between program units. Lower coupling is desirable.

From given coupling types, least desirable to most desirable ranking is

Content – Common – Control – Stamp – Data.

Hence, the correct option is (A).

2. Cyclomatic complexity of each of the modules A and B is 10. Then the cyclomatic complexity of sequential integration of A and $B = 10 + 10 - 1 = 19$.

Hence, the correct option is (A).

3. Basic COCOMO model:

Mode: Embedded

Lines of code = 40,000 = 40 KLOC

Multiplicative factor = 2.8.

Effort = $2.8 * (40)^{1.20}$

= 234.22 persons/month

Hence, the correct option is (A).

4. This function handles 4 different cases.

Case I: When coefficient $a = 0$, this case is tested by T_1 and T_2.

Case II: When discriminant is positive, T_5 tests this case.

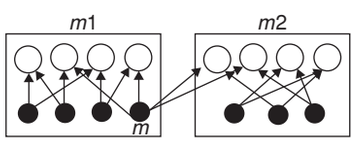
Case III: When discriminant is zero, any one of T_3 and T_4 tests this case.

Case IV: When discriminant is negative, only T_6 tests this case.

So Non-redundant tests are T_2, T_4, T_5, T_6 from the choices.

Hence, the correct option is (C).

5. In the following figure:



Filled circles represent methods. Unfilled circles represent attributes.

Average cohesion

$$= \frac{\text{Number of connections with in a module}}{\text{Total methods and attributes}}$$

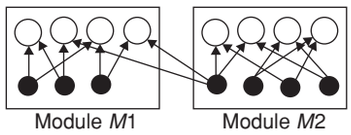
$$= \frac{14}{15}$$

(i.e., connections within modules)

Average coupling

$$= \frac{\text{Number connections between modules}}{\text{Number of modules}} = \frac{2}{2}$$

After moving module m from M_1 to M_2, the figure changes as follows:



Average cohesion $= \frac{14}{15}$

Average coupling $= \frac{2}{2}$

$\therefore$ There is no change.

Hence, the correct option is (A).

6. In test case 1,

Oldc = abc

Newc = dab

We need to replace a, b, c with d, a, b respectively.

Given $A = abcde$

This will be modified as

$A = dabde$

By using given code,

If $i = 0 \Rightarrow A[i] = a$

$j = 0 \Rightarrow a = a \Rightarrow A[0] = d$

$j = 1 \Rightarrow d \neq b$

$j = 2 \Rightarrow d \neq c$

If $i = 1 \Rightarrow A[i] = b$

$j = 0 \Rightarrow b \neq a$

$j = 1 \Rightarrow b = b \Rightarrow A[1] = a$

$j = 2 \Rightarrow a \neq c$

like this the loop repeats for $i = 2, 3, 4$

The flaw in given code is that it is again trying to replace a character, which is already replaced.

This will be exposed if the replaced character matches with next characters of oldc.

This is not happening in test case 1.

Test case 2,

Oldc = *cde*

Newc = *bcd*

A = *abcde*

New *A* = *abbcd*

Test case 3,

Oldc = *bca*

Newc = *cda*

A = *abcde*

New *A* = *acdde* (correct)

But given code outputs new *A* = *addde* (wrong)

$\therefore$ Test case 3 exposes the flaw in given code.

Test case 4,

Oldc = *abc*

Newc = *bac*

A = *abcde*

New *A* = *bacde* (correct)

But given code outputs,

New *A* = *aacde* (wrong)

$\therefore$ Test cases 3 and 4 expose the flaw in given code.

Hence, the correct option is (C).

7. Only test cases 3 and 4 will identify the flaw.

In test case 3, we replace *b* with *c*. But *c* occurs in oldc next to *b*. So it is again replaced with *d*.

Similarly for test case 4.

Hence, the correct option is (B).

8. Cohesion is dependency within the module where as coupling is dependency between different modules.

Hence, the correct option is (B).

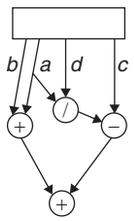
TEST

HINTS/SOLUTIONS

1. Organic projects have small teams with good experience, working with less than rigid requirements.

Hence, the correct option is (A).

8.



Phase 1:

$a + b$

a/d

Phase 2:

$(a/d) - c$

Phase 3:

$(a + b) * ((a/d) - c)$

Hence, the correct option is (C).

9. To compute gross pay we need employee number, hours worked and hourly wage rate. Hourly wage rate data flow is missing here.

Hence, the correct option is (C).

10. Hence, the correct option is (B).

11. A dataflow cannot connect two distinct data stores without an intermediate processing step.

Hence, the correct option is (B).

12. A data flow cannot be split into flows with different names and meanings.

Hence, the correct option is (A).

14. Process *P*2 has all input data flow and no output data flow.

Hence, the correct option is (A).

16. First phase of software development is requirement analysis.

Hence, the correct option is (A).

23. In constructive cost model every aspect of software design is determined based on the cost of the software.

Hence, the correct option is (B).