MCKV Institute of Engineering

Paper Code: PC-IT601

Paper Name: Software Engineering

Time Allotted: **3 Hours** ***Full Marks:*** 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***ten*** of the following: 10×1=10

i. Spiral Model was developed by

(a) Bev Littlewood (b) Berry Boehm (c) Roger Pressman (d) Victor Basili

ii. For a composite conditional expression of n components in condition coverage testing, number of test cases are required

(a) 2n (b) 2^n (c) 2n+1 (d) none of the above

iii. Which is NOT a software characteristic?

(a) Software does not wear out (b) Software is flexible

(c) Software is not manufactured (d) Software is always correct

iv. Context diagram explains

(a) The overview of the system (b) The internal view of the system

(c) The entities of the system (d) None of the above

v. For a control flow graph(G) of a program, the cyclomatic complexity V(G) can be computed as- (where E=no of edges & N=no of nodes)

(a) V(G)=E-N+2 (b) V(G)=E+N+2 (c) V(G)=E-N+1 (d) None of them

vi. Integration testing techniques are

(a) Top down (b) Bottom up (c) Sandwich (d) All of them

vii. Validation is

(a) Checking the product with respect to customer's expectation

(b) Checking the product with respect to specifications

(c) Checking the product with respect to the constraints of the project

(d) All of the above

viii. Requirements elicitation means

(a) Gathering of requirements (b) Capturing of requirements

(c) Understanding of requirements (d) All of the above

ix. Critical path is-

(a) The most complex path of a program (b) A path where errors may occur

(c) The chain of activities that determines the duration of the project

(d) Highly complex path of a project

x. The worst type of coupling is

(a) Content coupling (b) Common coupling (c) External coupling (d) Data coupling

xi. An Effort of 100 PM implies that-

(a) 100 persons should work for 1 month

(b) 1 person should be employed for 100 months

(c) the area under the person-month curve (d) none of the above

xii. The main objectives of code walk through are to

(a) discover algorithmic & logical errors (b) discover syntax & logical errors

(c) discover syntax & algorithmic errors (d) none of the above

Group – B

(Short Answer Type Questions)

Answer any ***three*** of the following 3×5=15

2. Explain different types of feasibility study. *(Module 1/CO1/Understand-LOCQ)* [5]

3. Explain–"When the schedule of a project is compressed, the required effort increases in proportion to the fourth power of the degree of compression".

(Module 3/CO2/Understand-LOCQ) [5]

4. "Software does not wear out"- Justify your answer.

(Module 1/CO1/Evaluate-HOCQ) [5]

5. For a good software design "low coupling – high cohesion" is desirable. Explain.

(Module 2/CO1/Understand-LOCQ) [5]

6. What are the major differences between Function Oriented Software Design and Object-Oriented Software Design?

(Module 2/CO1/Remember-LOCQ) [5]

Group – C

(Long Answer Type Questions)

Answer any ***three*** of the following 3×15=45

7.(a) Why is Function Point metric better than LOC?

(Module 3/CO2/Understand-LOCQ) [3]

(b) Consider a project with following data:

(Values within bracket indicates weighting factor)

No. of external inputs with low (3) complexity = 10

No. of external inputs with high (6) complexity = 10

No. of external outputs with average (5) complexity = 15

No. of external inquires with low (3) complexity = 13

No. of internal logical files with high (15) complexity = 2

No. of internal logical files with low (7) complexity = 2

No. of external interface with average (7) complexity = 7

The system has a very high transaction rate and supports multiple communication protocols. Calculate the unadjusted as well as adjusted function points.

(Module 3/CO2/Apply-IOCQ) [10]

8.(c) Define Software Quality Assurance (SQA). *(Module 3/CO2/Remember-LOCQ)* [2]

8.(a) Why is COCOMO called heuristic estimation technique?

(Module 1/CO1/Understand-LOCQ) [5]

(b)Why is intermediate COCOMO considered better than basic COCOMO?

(Module 3/CO2/Understand-LOCQ) [3]

(c) Consider a project of Size=200 KLOC with the following data:

Cost drivers:

Software Reliability=1.15

Use of software tools=0.91

Product complexity=0.85

Execution time constraint=1.00

Calculate the effort for three types of project (Organic, Semidetached and Embedded) using COCOMO model. *(Module 3/CO2/Apply-IOCQ)* [7]

9.(a) A project size of 200 KLOC is to be developed. Software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate the effort & development time of the project.

(Module 3/CO2/Apply-IOCQ) [5]

(b) Suppose a system for office automation is to be designed. There are four major modules in the system: Data entry, Data update, Query & report generator. The project falls in the Organic category. The sizes of different modules are in the ratio 2:2:3:5 and the total size of the project is 60 KLOC. The ratings of the cost drivers' attributes are assumed as follows:

Complexity	High	1.15
Storage	High	1.06
Experience	High	1.13
Programmers' ability	High	1.17

Obtain Effort estimates for the project for different modules.

(Module 3/CO2/Apply-IOCQ) [10]

10. (a) Describe risk monitoring and risk control in software management.

(Module4/CO3/Understand-LOCQ) [3]

(b) The following table indicates the various tasks involved in completing a software project, the corresponding activities and the estimated effort of each task in person-months:

Notation	Activity	Effort in person-months
T_1	Requirements specification	1
T_2	Design database part	2
T_3	Design GUI part	2
T_4	Code database part	5
T_5	Code GUI part	3
T_6	Integrate Modules	1
T_7	Test Modules	6
T_8	Write user manual	3

The precedence relation $T_i \leq \{T_j, T_k\}$ implies that task T_i must complete before task T_j or T_k can start. The following precedence relation is known to hold among different tasks:

$$T_1 \leq T_2 \leq \{T_3, T_4, T_5, T_6\} \leq T_7.$$

Draw the activity network and Gnatt chart representation for the project.

(Module 3/CO2/Apply-IOCQ) [12]

11.(a) Draw the control flow graph for the following program. Also calculate the cyclomatic complexity. *(Module 3/CO2/Apply-IOCQ)* [5]

```
int gcd ( int x, int y)
{
   while (x! = y)
   {
         if (x>y)
         x= x – y;
      else y= y – x;
   }
return x;
}
```

(b) What are the different levels of Testing and their goals?

(Module4/CO3/Understand-LOCQ) [5]

(c) Assume that the size of an organic type software product has been estimated to be 32000 LOC. Average salary of software engineers is Rs 15000 per month. Determine the Effort required to develop the software product and the Development time.

(Module 3/CO2/Apply-IOCQ) [5]

MCKV Institute of Engineering

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Full Marks: **70**

Time Allotted: **3 Hours**

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Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***ten*** of the following: 10×1=10

(i)In the Spiral model the radius of the spiral at any point represents
a) the level of risk
b) the progress made in the current phase
c) the cost incurred in the project till then
d) none of the above

(ii) Verification is
a) Checking the product with respect to customer's expectation
b) Checking the product with respect to specifications
c) Checking the product with respect to the constraints of the project
d) All of the above

(iii)when the schedule of a project is compressed, the required development effort as well as project development cost increases in proportion to
a) the fourth power of the degree of compression
b) the third power of the degree of compression
c) the fifth power of the degree of compression
d) none of the above

(iv) A critical task is one with
a) slack time equals to one
b) zero slack time
c) slack time equals to five
d) none of the above

(v)Context diagram explains
a) The overview of the system
b) The internal view of the system
c) The entities of the system
d) None of them

(vi) PERT means-
a) Project Evaluation and Review Technique
b) Project Estimation and Review Technique
c) Program Evaluation and Reject Technique
d) None of them

(vii)An example of single variable heuristic cost estimation model is
a) Halstead's software science
b) Basic COCOMO model
c) Intermediate COCOMO model
d) Complete COCOMO model

(viii) Cyclomatic complexity is equal to
a) Number of independent paths b) Number of paths
c) Number of edges d) None of the above

(ix) Site for Beta testing is
a) Software company b) User's site c) Anywhere d) All of them

(x) An Effort of 100 PM implies that-
a) 100 persons should work for 1 month b) 1 person should be employed for 100 months
c) the area under the person-month curve d) none of them

(xi) For a control flow graph(G) of a program, the Cyclomatic complexity V(G) can be computed as- (where E=no of edges & N=no of nodes)
a) V(G)=E-N+2 b) V(G)=E+N+2 c) V(G)=E-N+1 d) None of them

(xii) The main purpose of Integration testing is to find
a) Design errors b) Analysis errors c) Procedure errors d) Interface errors

Group – B

(Short Answer Type Questions) 3×5=15

Answer any ***three*** of the following

2. Explain—"When the schedule of a project is compressed, the required effort increases in proportion to the fourth power of the degree of compression". 5
[Module3/CO2/Understand-LOCQ]

3. "Software does not wear out"- Justify your answer. 5
[Module 1/CO1/Evaluate-HOCQ]

4. For a good software design "low coupling – high cohesion" is desirable. Explain 5
[(Module 2/CO1/Understand-LOCQ]

5. Draw the use-case diagram for a bank ATM system. 5
[Module 4/CO3/Apply-IOCQ]

6. Why Black-Box testing is called Functional testing and White-Box testing is called Structural testing? 5
[Module 4/CO3/Understand-LOCQ]

Group – C

(Long Answer Type Questions) 3×15=45

Answer any ***three*** of the following

7.a) What are the different levels of Testing and their goals? 5
[Module4/CO3/Understand-LOCQ]

b) Consider the following function:

```
Void short (int a[], int n) {
    int i, j;
    for ( i=0; i<n-i; i++)
```

```
for (j=i+1; j<n; j++)
  if ( a[i]>a[j])
  {
    temp = a[i];
    a[i] = a[j];
    a[j] = temp;
  }
}
```

Design a test suite for the function sort using 'statement coverage' and 'Branch coverage' testing strategies.

[Module 4/CO3/Apply-IOCQ)] 10

8.a) What are the major differences between Function Oriented Software Design and Object Oriented Software Design?

[Module 2/CO1/Remember-LOCQ] 5

b) Suppose a system for office automation is to be designed. There are four major modules in the system: Data entry, Data update, Query & report generator. The project falls in the Organic category. The sizes of different modules are in the ratio 2:2:3:5 and the total size of the project is 60 KLOC. The ratings of the cost drivers attributes are assumed as follows:

Complexity	High	1.15
Storage	High	1.06
Experience	High	1.13
Programmers ability	High	1.17

Obtain Effort estimates for the project for different modules. 10

[Module 3/CO2/Apply- IOCQ]

9.a) Why is Function Point metric better than LOC? 3

[Module 3/CO2/Understand-LOCQ]

b) The following table indicates the various tasks involved in completing a software project, the corresponding activities and the estimated effort of each task in person-months:

Notation	Activity	Effort in person-months
T_1	Requirements specification	1
T_2	Design database part	2
T_3	Design GUI part	2
T_4	Code database part	5
T_5	Code GUI part	3
T_6	Integrate Modules	1
T_7	Test Modules	6
T_8	Write user manual	3

The precedence relation $T_i \leq \{T_j, T_k\}$ implies that task T_i must complete before task T_j or T_k can start. The following precedence relation is known to hold among different tasks:

$$T_1 \leq T_2 \leq \{T_3, T_4, T5, T6\} \leq T_7.$$

Draw the activity network and Gnatt chart representation for the project. 12

[Module 3/CO2/Apply-IOCQ]

10.a) Draw the control flow graph for the following program. Also calculate the cyclomatic complexity.

```
int gcd ( int x, int y)
{
    while (x! = y)
    {
        if (x>y)
            x= x – y;
        else y= y – x;
    }
return x;
}
```

5

[Module 1/CO1/Evaluate- HOCQ]

b) Consider a project of Size=200 KLOC with the following data:

Cost drivers:

Software Reliability=1.15

Use of software tools=0.91

Product complexity=0.85

Execution time constraint=1.00

Calculate the effort for three types of project (Organic, Semidetached and Embedded) using COCOMO model. 10

[Module 3/CO2/Apply-IOCQ]

11.a) Branch coverage testing is stronger than statement coverage testing--- Justify your answer with a suitable example. 5

[Module 4/CO3/Evaluate-HOCQ]

b) Compare and contrast between Democratic and Chief-programmer team structure? 5

[Module 4/CO3/Understand-LOCQ]

c) How complex logic can be represented using decision trees and decision table? Explain with example. 5

[Module 2/CO1/Understand-LOCQ]

Institute of Engineering

A101 (32)

MCKV Institute of Engineering

Paper Code: PC-IT601

Paper Name: Software Engineering

Time Allotted: 1 Hour | *Full Marks: 30*

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Group – A

(Multiple Choice Type Questions)

Choose the correct alternatives for any ***five*** of the following: 5×1=5

i. Pure egoless programming is encouraged by which team organization?
   a) Chief programmer team structure
   b) Democratic team structure
   c) Mixed control team structure
   d) None of these

ii. Critical path is-
   (a) The most complex path of a program
   (b) A path where errors may occur
   (c) The chain of activities that determines the duration of the project
   (d) Highly complex path of a project

iii. Effort is measured in terms of:
   (a) Person-months
   (b) Rupees
   (c) Persons
   (d) Months

iv. Validation is
   (a) Checking the product with respect to customer's expectation
   (b) Checking the product with respect specifications
   (c) Checking the product with respect to the constraints of the project
   (d) All of the above

v. For a control flow graph(G) of a program, the cyclomatic complexity V(G) can be computed as- (where E=no of edges & N=no of nodes)
   (a) V(G)=E-N+2
   (b) V(G)=E+N+2
   (c) V(G)=E-N+1
   (d) None of the above

vi. Beta Testing is done by-
   (a) The developer
   (b) A small group of friendly customers
   (c) The test team
   (d) None of these

vii. Which of the following diagram is time oriented?
   (a) Collaboration
   (b) Sequence
   (c) Activity
   (d) None of the mentioned

Group – B

(Short Answer Type Questions)

2×5=10

Answer any ***two*** of the following

2. Explain—"When the schedule of a project is compressed, the required effort increases in proportion to the fourth power of the degree of compression". (Module 3/CO2/Understand-LOCQ)

3. Draw the control flow graph for the following program. Also calculate the cyclomatic complexity. (Module 3/CO2/Apply-IOCQ)

```
int gcd ( int x, int y)
{
while (x! = y)
        {
        if (x>y)
        x= x – y;
         else y= y – x;
         }
return x;
}
```

4. What are the different levels of Testing and their goals? (Module4/CO3/Understand-LOCQ)

Group – C

(Long Answer Type Questions)

Answer any ***one*** of the following 1×15=15

5. The following table indicates the various tasks involved in completing a software project, the corresponding activities and the estimated effort of each task in person-months:

Notation	Activity	Effort in person-months
T_1	Requirements specification	1
T_2	Design database part	2
T_3	Design GUI part	2
T_4	Code database part	5
T_5	Code GUI part	3
T_6	Integrate Modules	1
T_7	Test Modules	6
T_8	Write user manual	3

The precedence relation $T_i \leq \{T_j, T_k\}$ implies that task T_i must complete before task T_j or T_k can start. The following precedence relation is known to hold among different tasks:

$T_1 \leq T_2 \leq \{T_3, T_4, T_5, T_6\} \leq T_7$.

Draw the activity network and Gnatt chart representation for the project. (Module 3/CO2/Apply-IOCQ)

6. (a) Discuss the different types of team structures followed in software projects. (Module 3/CO2/Understand-LOCQ) 8

(b) Draw the use-case diagram for a bank ATM system. (Module4/CO3/Apply-IOCQ) 5

(c) What is ego-less programming? (Module 3/CO2/Understand-LOCQ) 2

MCKV Institute of Engineering

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: 5×1=5

(i) Which of the following life cycle model deals with risks associated with software products?
(a) Prototyping model (b) Waterfall model (c) Spiral model (d) Incremental model
(ii) The worst type of coupling is-
(a) Content coupling (b) Common coupling (c) External coupling (d)Data coupling
(iii) Spiral Model was developed by-
(a) Bev Littlewood (b) Berry Boehm (c) Roger Pressman (d) Victor Basili
(iv) Which is not a software life cycle model?
(a) Waterfall model (b) Spiral model (c) Prototyping model (d) Capability maturity model
(v) Which phase is not available in software life cycle?
(a) Coding (b) Testing (c) Maintenance (d) Abstraction
(vi) The context diagram is also known as
(a) Level-0 DFD (b) Level-1 DFD (c) Level-2 DFD (d) None of the above
(vii) Which is NOT a software characteristic?
(a) Software does not wear out (b) Software is flexible
(c) Software is not manufactured (d) Soft.. are is always correct

Group – B

(Short Answer Type Questions)

Answer any ***two*** of the following 2×5=10

2. Explain different types of feasibility study. (CO1/Understand/LOCQ)
3. "Software does not wear out"- Justify your answer. (CO1/Evaluate/HOCQ)
4. Illustrate the generic Waterfall Model of Software development. (CO1/Analyse/IOCQ)

Group – C

(Long Answer Type Questions)

Answer any ***one*** of the following 1×15=15

5. (a) Explain Spiral Model of Software Development with a neat diagram. (CO1/Understand/LOCQ) 10
(b) Discuss the advantages and disadvantages of Waterfall model for software development. (CO1/Understand/LOCQ) 5

6. (a) Describe Software Development Life Cycle (SDLC). (CO1/Understand/LOCQ) 5
(b) Explain the Prototyping process model and discuss the advantages and disadvantages of using this model for software development. (CO1/Understand/LOCQ) 10

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Software Engineering

Time Allotted: 1* Hour** ***Full Marks: 30

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: **5×1**

i. Context diagram explains-
(a) The overview of the system (b) The internal view of the system
(c) The entities of the system (d) None of the above

ii. Spiral Model was developed by-
(a) Bev Littlewood (b) Berry Boehm
(c) Roger Pressman (d) Victor Basili

iii. Which of the following life cycle model deals with risks associated with software products?
(a) Prototyping model (b) Waterfall model
(c) Spiral model (d) Incremental model

iv. The worst type of coupling is-
(a) Content coupling (b) Common coupling
(c) External coupling (d) Data coupling

v. In the Spiral model the radius of the spiral at any point represents-
(a) the level of risk (b) the progress made in the current phase
(c) the cost incurred in the project till then (d) none of the above

vi. Requirements elicitation means-
(a) Gathering of requirements (b) Capturing of requirements
(c) Understanding of requirements (d) All of the above

vii. What is the final outcome of the analysis & specification phase?
(a) DED (b) SRS document
(c) Use Case diagram (d) None of the above

Group – B

(Short Answer Type Questions)

Answer any ***two*** of the following **2×5**

2. For a good software design "low coupling – high cohesion" is desirable. Explain. (Module 2/CO1/Understand-LOCQ)

3. "Software does not wear out"- Justify your answer. (Module 1/CO1/Evaluate-HOCQ)

4. Explain different types of feasibility study. (Module 1/CO1/Understand-LOCQ)

Group – C

(Long Answer Type Questions)

Answer any ***one*** of the following **1×15**

5. (a) Describe all the phases of SDLC. (Module 1/CO1/Understand-LOCQ) 5
   (b) Explain Spiral Model of Software Development with a neat diagram. (Module 1/CO1/Understand-LOCQ) 10

6. (a) Discuss the advantages and disadvantages of Waterfall model for software development. (Module 1/CO1/Understand-LOCQ) 5
   (b) Explain the different stages of Iterative waterfall model with diagram. (Module 1/CO1/Understand-LOCQ) 10

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MCKV Institute of Engineering

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Software Engineering

Time Allotted: 1* Hour** ***Full Marks: 30

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: **5×1**

I. Critical path is-
(a) The most complex path of a program
(b) A path where errors may occur
(c) The chain of activities that determines the duration of the project
(d) Highly complex path of a project

II. The main objectives of code walk through are to
(a) discover algorithmic & logical errors (b) discover syntax & logical errors
(c) discover syntax & algorithmic errors (d) none of the above

III. Software testing is:
(a) the process of demonstrating that errors are not present
(b) the process of establishing confidence that a program does what it is supposed to do
(c) the process of executing a program to show it is working as per specifications
(d) the process of executing a program with the intent of finding errors

IV. Verification is
(a) Checking the product with respect to customer's expectation
(b) Checking the product with respect to specifications
(c) Checking the product with respect to the constraints of the project
(d) All of the above

V. An example of single variable heuristic cost estimation model is
(a) Halstead's software science (b) basic COCOMO model
(c) intermediate COCOMO model (d) complete COCOMO model

VI. What are the various Testing Levels?
(a) Unit Testing (b) System Testing
(c) Integration Testing (d) All of the mentioned

VII. Unit testing is done by
(a) Users (b) Developers (c) Customers (d) None of the mentioned

Group – B

(Short Answer Type Questions)

Answer any ***two*** of the following **2×5**

2. Explain—"When the schedule of a project is compressed, the required effort increases in proportion to the fourth power of the degree of compression". (Module 3/CO2/Understand-LOCQ) 5
3. Why Black-Box testing is called Functional testing and White-Box testing is called Structural testing? (Module4/CO3/Understand-LOCQ) 5
4. A project size of 200 KLOC is to be developed. Software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate the effort & development time of the project. (Module 3/CO2/Apply-IOCQ) 5

Group – C

(Long Answer Type Questions)

Answer any ***one*** of the following **1×15**

5. (a) Why is Function Point metric better than LOC? (Module 3/CO2/Understand-LOCQ) 3
(b) Suppose a system for office automation is to be designed. There are four major modules in the system: Data entry, Data update, Query & report generator. The project falls in the Organic category. The sizes of different modules are in the ratio 2:2:3:5 and the total size of the project is 60 KLOC. The ratings of the cost drivers attributes are assumed as follows:

Complexity	High	1.15
Storage	High	1.06
Experience	High	1.13
Programmers ability	High	1.17

Obtain Effort estimates for the project for different modules. (Module 3/CO2/Apply-IOCQ) 12

6. The following table indicates the various tasks involved in completing a software project, the corresponding activities and the estimated effort of each task in person-months:

Notation	Activity	Effort in person-months
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The precedence relation $T_i \leq \{T_j, T_k\}$ implies that task T_i must complete before task T_j or T_k can start. The following precedence relation is known to hold among different tasks: $T_1 \leq T_2 \leq \{T_3, T_4, T_5, T_6\} \leq T_7$.
Draw the activity network and Gnatt chart representation for the project. (Module 3/CO2/Apply-IOCQ) 15