



CUMMINS COLLEGE OF ENGINEERING FOR WOMEN

**(An Autonomous Institute affiliated to Savitribai Phule Pune
University)**

Third Year Computer

SOFTWARE DESIGN AND ARCHITECTURE (CE3203)

Duration : 02:00 Hours

Max Marks : 50

Instructions :

1. All questions are compulsory.
2. Please read each question carefully.
3. **SHORT, PRECISE and CONCISE answers are expected.**
4. The ANSWER must be clear, lucid and SPECIFIC TO the QUESTION asked.
5. Most questions are based on hypothetical systems / examples. MAKE SUITABLE ASSUMPTIONS about scope of such systems / examples, wherever relevant. (IMPORTANT INSTRUCTION)
6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why Iterative model is advantageous over the Waterfall model for software Development? (Hint: Your answer should be based on limitations of Waterfall model and advantages of Iterative model.) (13)

(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

- i) Functional requirements
 - ii) Operating Environment
- (04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Response
 - ii) Stimulus
 - iii) Response Measure
- (03 Marks)

d) Consider a Presentation Software like “MS Power Point”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Presentation Software.

(03 Marks)

Q No 2 a) a) For a typical “College Library Management System”, (6)
consider a use case “Borrow a book”. For the implementation
of this use case, identify and give ONE relevant example for
ANY 2 types of classes from the following:
Boundary classes, Entity classes, Control Classes
(02 Marks)

b) Draw a Use Case Diagram for a typical “Movie Ticket
Booking System” using full and correct notations. Your
diagram should include at least ONE example of <<include>>
relationship in above system. Make suitable assumptions about
scope of the above system.
(04 Marks)

Unit-3

- Q No 3 a) a) Give a non-software example for the Factory Method pattern. (15)
Explain how the Factory Method pattern works using above non-software example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Explain the role of each of the Participants in Mediator pattern.
(02 Marks)
- d) Why Observer Pattern and Mediator Pattern are called as related patterns? What are the similarities and differences between these two above patterns?
(Hint: Make use of design pattern fields like Intent, Motivation, Applicability etc. to answer above two questions.)
(03 Marks)
- e) Write on the Applicability/use of the Iterator Design Pattern.
(02 Marks)
- f) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Model View Controller (MVC) Pattern with the help of its advantages, in the above example.
(03 Marks)

Q No 4 a) a) What do you mean by a “Test case”?
(01 Mark)

(7)

b) Consider a typical "Online Banking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.

(02 Marks)

c) Consider a code fragment as given below.

```
int main()
{
    int n1, n2
    printf("Enter two positive integers: ");
    scanf("%d %d",&n1,&n2)
    while(n1!=n2) {
        if(n1 > n2)
            n1= n1-n2;
        else n2 = n2- n1;
    }
    printf("GCD = %d",n1); }
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths**, for the drawn graph. **Write down the Test cases covering the identified independent paths.**

(04 Marks)

Q No 5 a) a) Differentiate between Validation and Verification.
(03 Marks)

(9)

b) Given a typical use case “Withdraw Money from ATM”.
For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
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Unit-1

- Q No 1 a) a) Justify the importance of “Software Architecture” in the development of any software. (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (03 Marks) (13)
- b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.
- i) Functional requirements
 - ii) External interfaces
- (04 Marks)
- c) In the context of general scenario of Usability, explain the following terms.
- i) Source of Stimulus
 - ii) Response Measure
 - iii) Artifact
- (03 Marks)
- d) Consider a Search Engine like “Google”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Search Engine application. (03 Marks)

Q No 2 a) a) For typical “Online Banking System”, consider a use case (6)
“Transfer Money”. For the implementation of this use case,
identify and give ONE relevant example for ANY 2 types of
classes from the following:
Boundary classes, Entity classes, Control Classes
(02 Marks)

b) Consider a use case “Place an Order” for a typical “Online
Shopping System”.
For this use case, Draw an ACTIVITY DIAGRAM using full
and correct notations. Your diagram must show use of “Branch
and Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.
(04 Marks)

Q No 3 a) Explain the Motivation of Adapter Design Pattern with example.

(02 Marks)

b) Justify the need/use/importance of Factory Method Pattern with the help of its advantages/consequences/applicability.

(03 Marks)

c) Explain the role of each of the Participants in Mediator pattern.

(02 Marks)

d) Why Observer Pattern is needed? Justify with example.

(Hint: Your answer should be based on advantages/applicability/consequences of Observer Pattern.)

(03 Marks)

e) Give a non-software example for the Iterator pattern. Explain how the Iterator Pattern works using above non-software example.

(02 Marks)

f) Justify the need/use/importance of Model View Controller (MVC) Pattern with the help of its advantages.

(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical " Online Placement system of the College ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void numcheck(int i){  
    while (i<10) {  
        System.out.println("i is %d", i);  
        if (i%2 == 0)  
            System.out.println("even");  
        else  
            System.out.println("odd");  
        i=i+1;    }  
    }
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Differentiate between Validation and Verification.
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(9)

b) Given a typical use case “Withdraw Money from ATM”.
For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
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Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Incremental model of software development.

(13)

(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

i) Non-Functional requirements

ii) Product Perspective

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Cancel

ii) Maintain Task Model

(03 Marks)

d) Consider a Document Editing Product like “MS Word”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Document Editing Product.

(03 Marks)

Q No 2 a) a) For typical “Online Banking System”, consider a use case (6)
“Transfer Money”. For the implementation of this use case,
identify and give ONE relevant example for ANY 2 types of
classes from the following:
Boundary classes, Entity classes, Control Classes
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Shopping System”.
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and correct notations. Your diagram must show use of “Branch
and Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.
(04 Marks)

Q No 3 a) a) Explain the role of each of the Participants in Adapter pattern.
(02 Marks)

(15)

b) Justify the need/use/importance of Factory Method Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

c) Give a non-software example for the Mediator pattern. Explain how the Mediator pattern works using above non-software example.
(02 Marks)

d) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Observer Pattern with the help of its advantages, in the above example.
(03 Marks)

e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)

f) When one can iterate over a linked list or an array by using *ptr --> next* or *i++*, why do we need an Iterator pattern? What are the advantages of Iterator pattern?
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) In the context of software testing, Compare and Contrast Validation and Verification. (9)
(03 Marks)

b) Given a typical use case “Cancel Ticket” for “Online Railway Reservation System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
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Unit-1

Q No 1 a) a) Why “Software Architecture” is an important stage/activity/phase in the development of any Software? (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

- i) Allocation Structures
 - ii) Component-and-connector Structures
- (04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Stimulus
 - ii) Response
 - iii) Environment
- (03 Marks)

d) Consider a Document Editing Product like “MS Word”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Document Editing Product.

(03 Marks)

Q No 2 a) a) Consider a typical “Online Hostel Management System”. (6)

Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes.

(02 Marks)

b) Draw a Use Case Diagram for a typical “Online Hospital Management System” using full and correct notations. Your should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

- Q No 3 a) a) Explain the Motivation of Factory Method Design Pattern with example. (15)
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Give a non-software example for the Observer pattern. Explain how the Observer pattern works using above non-software example.
(02 Marks)
- d) Why Mediator Pattern is needed? Justify with example.
(Hint: Your answer should be based on advantages/applicability of Mediator Pattern.)
(03 Marks)
- e) What is the Intent of Iterator Design Pattern? Draw a neat diagram for “Class Structure” of Iterator pattern.
(02 Marks)
- f) Justify the need/use/importance of Iterator Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

Q No 4 a) a) What do you mean by a “Test case”?
(01 Marks)

(7)

b) Consider a typical "Online Tour and Management ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.

(02 Marks)

c) Consider a code fragment as given below.

```
public void howComplex(int i){  
    while (i<10) {  
        System.out.println("i is %d", i);  
        if (i%2 == 0)  
            System.out.println("even");  
        else  
            System.out.println("odd");  
        i=i+1;    }  
    }
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths**, for the drawn graph. **Write down the Test cases covering the identified independent paths.**

(04 Marks)

Q No 5 a) a) Why Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Book Ticket” for “Online Airline Reservation System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
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Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Incremental model of software development.

(13)

(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

i) Non-Functional requirements

ii) Product Perspective

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Cancel

ii) Maintain Task Model

(03 Marks)

d) Consider a Document Editing Product like “MS Word”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Document Editing Product.

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b) Draw a Use Case Diagram for a typical “Online Hospital Management System” using full and correct notations. Your should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

- Q No 3 a) a) Give a non-software example for the Adapter pattern. (15)
Explain how the Adapter Pattern works using above non-software example.
(02 Marks)
- b) Why Factory Method Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages/applicability of Factory Method Pattern.)
(03 Marks)
- c) Explain the Motivation of Observer Design Pattern with example.
(02 Marks)
- d) Justify the need/use/importance of Mediator Pattern with the help of its advantages/consequences.
(03 Marks)
- e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)
- f) Why Model View Controller (MVC) Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages of MVC Pattern.)
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01Mark)

(7)

b) Consider a typical " Online Bus Ticket Booking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.
int main()
{

```
    int n1, n2 ;  
    printf("Enter two positive integers: ");  
    scanf("%d %d",&n1,&n2);  
    while(n1!=n2) {  
        if(n1 > n2)  
            n1= n1-n2;  
        else n2 = n2- n1;  
    }  
    printf("GCD = %d",n1); }
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Why Black box Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Create account” on “Social Networking site like LinkedIn”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
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Unit-1

- Q No 1 a) a) Justify the importance of “Software Architecture” in the development of any software. (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (03 Marks) (13)
- b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.
- i) Functional requirements
 - ii) External interfaces
- (04 Marks)
- c) In the context of general scenario of Usability, explain the following terms.
- i) Source of Stimulus
 - ii) Response Measure
 - iii) Artifact
- (03 Marks)
- d) Consider a Search Engine like “Google”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Search Engine application. (03 Marks)

Q No 2 a) a) Consider a hypothetical “University Examination System”. (6)

For this system, identify ANY ONE CLASS with a detailed list of attributes and operations.

Write the full specification of the identified CLASS with full UML notation, having the compartments showing the list of:

i) Attributes

ii) Operations with full signature and stereotypes

(02 Marks)

b) Consider a use case “Book a Room” for a typical “Online Hotel Management System”. For this use case, Draw an ACTIVITY DIAGRAM using full and correct notations. Your diagram must show use of “Branch and Merge” and “Fork and Join” concepts (using full & correct notations). Make suitable assumptions about the scope of the above system.

(04 Marks)

- Q No 3 a) a) Explain the Motivation of Factory Method Design Pattern (15)
with example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Give a non-software example for the Observer pattern. Explain how the Observer pattern works using above non-software example.
(02 Marks)
- d) Why Mediator Pattern is needed? Justify with example.
(Hint: Your answer should be based on advantages/applicability of Mediator Pattern.)
(03 Marks)
- e) What is the Intent of Iterator Design Pattern? Draw a neat diagram for “Class Structure” of Iterator pattern.
(02 Marks)
- f) Justify the need/use/importance of Iterator Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01Mark)

(7)

b) Consider a typical " Online Bus Ticket Booking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.
int main()

```
{  
    int n1, n2 ;  
    printf("Enter two positive integers: ");  
    scanf("%d %d",&n1,&n2);  
    while(n1!=n2) {  
        if(n1 > n2)  
            n1= n1-n2;  
        else n2 = n2- n1;  
    }  
    printf("GCD = %d",n1); }
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

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b) Given a typical use case “Create account” on “Social Networking site like LinkedIn”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
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Unit-1

- Q No 1 a) a) Compare and Contrast Waterfall model of software development and Iterative model of software development. (03 Marks) (13)
- b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.
- i) Product Scope
 - ii) Design and Implementation Constraints
- (04 Marks)
- c) Explain with examples, each of the following tactics for Usability.
- i) Undo
 - ii) Maintain User Model
- (03 Marks)
- d) Consider an Online Chat Application like “WhatsApp”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Chat Application. (03 Marks)

Q No 2 a) a) For a typical “Online Airline Reservation System”, consider (6)
a use case "Cancel Ticket". For the implementation of this use
case, identify and give ONE relevant example for ANY 2 types
of classes from the following:

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Consider a use case “Take an appointment” for a typical
“Online Hospital Management System”. For this use case,
Draw an ACTIVITY DIAGRAM using full and correct
notations. Your diagram must show use of “Branch and
Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.

(04 Marks)

Q No 3 a) a) Write on the applicability/use of the Factory Method Design Pattern. (15)

(Hint: Make use of design pattern fields like Intent, Motivation, Applicability etc. to answer above question.)

(02 Marks)

b) Why Adapter Pattern and Proxy Pattern are called as related patterns?

What are the similarities and differences between these two above patterns?

(Hint: Make use of design pattern fields like Intent, Motivation, Applicability etc. to answer above question.)

(03 Marks)

c) Draw a neat and complete “Class Structure” diagram for the Observer pattern.

(02 Marks)

d) What is the Intent of Observer Design Pattern? In the context of Observer pattern, Compare and Contrast the Push and Pull models.

(03 Marks)

e) Explain the Motivation of Iterator Design Pattern with example.

(02 Marks)

f) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions Justify the need/use of Model View Controller(MVC) pattern with the help of its advantages, in the above example.

(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Compare and Contrast the Black box testing and White box testing. (9)
(03 Marks)

b) Given a typical use case "Issue book" for “College Book Library Management System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



CUMMINS COLLEGE OF ENGINEERING FOR WOMEN

**(An Autonomous Institute affiliated to Savitribai Phule Pune
University)**

Third Year Computer

SOFTWARE DESIGN AND ARCHITECTURE (CE3203)

Duration : 02:00 Hours

Max Marks : 50

Instructions :

1. All questions are compulsory.
2. Please read each question carefully.
3. **SHORT, PRECISE and CONCISE answers are expected.**
4. The ANSWER must be clear, lucid and SPECIFIC TO the QUESTION asked.
5. Most questions are based on hypothetical systems / examples. MAKE SUITABLE ASSUMPTIONS about scope of such systems / examples, wherever relevant. (IMPORTANT INSTRUCTION)
6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Iterative model of software development. (13)
(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

i) Product Scope

ii) Design and Implementation Constraints

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Undo

ii) Maintain User Model

(03 Marks)

d) Consider an Online Chat Application like “WhatsApp”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Chat Application.

(03 Marks)

Unit-2

Q No 2 a) a) Consider a typical “College Library Management System”. (6)
Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes.

(02 Marks)

b) Draw an Activity Diagram for “Making Tea” using full and correct notations. Your diagram must show use of “Fork and Join” and “Branch and Merge” concepts (using full & correct notations). Make suitable assumptions about scope.

(04 Marks)

Unit-3

- Q No 3 a) a) Explain the Motivation of Factory Method Design Pattern (15)
with example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Give a non-software example for the Observer pattern. Explain how the Observer pattern works using above non-software example.
(02 Marks)
- d) Why Mediator Pattern is needed? Justify with example.
(Hint: Your answer should be based on advantages/applicability of Mediator Pattern.)
(03 Marks)
- e) What is the Intent of Iterator Design Pattern? Draw a neat diagram for “Class Structure” of Iterator pattern.
(02 Marks)
- f) Justify the need/use/importance of Iterator Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Compare and Contrast the Black box testing and White box testing. (9)
(03 Marks)

b) Given a typical use case "Issue book" for “College Book Library Management System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why “Software Architecture” is an important stage/activity/phase in the development of any Software? (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

i) Module Structures

ii) Allocation Structures

(04 Marks)

c) Explain with examples, ANY TWO tactics for Usability. (03 Marks)

d) Consider an Online Email Service like “Gmail”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Email Service.

(03 Marks)

Unit-2

Q No 2 a) a) For a typical “College Library Management System”, consider a use case “Borrow a book”. For the implementation of this use case, identify and give ONE relevant example for ANY 2 types of classes from the following: (6)

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Draw a Use Case Diagram for a typical “Movie Ticket Booking System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

Unit-3

Q No 3 a) a) What is the Intent of Factory Method Design Pattern? Draw (15)
a neat diagram for “Class Structure” of Factory Method pattern.
(02 Marks)

b) Why Adapter Pattern is needed? Justify with example.
(Hint: Your answer should be based on
advantages/applicability of Adapter Pattern.)
(03 Marks)

c) Explain the Motivation of Mediator Design Pattern with
example.
(02 Marks)

d) Justify the need/use/importance of Observer Pattern with the
help of its advantages/consequences/applicability.
(03 Marks)

e) Explain the advantages of Model View Controller (MVC)
Pattern.
(02 Marks)

f) Why Iterator Pattern is needed? Justify with example.

(Hint: Your answer should be based on
advantages/applicability of Iterator Pattern.)
(03 Marks)

Q No 4 a) a) What do you mean by a “Test case”?
(01 Mark)

(7)

b) Consider a typical "Online Banking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.

(02 Marks)

c) Consider a code fragment as given below.

```
int main()
{
    int n1, n2
    printf("Enter two positive integers: ");
    scanf("%d %d",&n1,&n2)
    while(n1!=n2) {
        if(n1 > n2)
            n1= n1-n2;
        else n2 = n2- n1;
    }
    printf("GCD = %d",n1); }
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths**, for the drawn graph. **Write down the Test cases covering the identified independent paths.**

(04 Marks)

Q No 5 a) a) Why Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Book Ticket” for “Online Airline Reservation System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why Incremental model is advantageous over the Waterfall model for Software Development? (Hint: Your answer should be based on limitations of Waterfall model and advantages of Incremental model.) (13)
(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

- i) Non-functional requirements
- ii) External interfaces

(04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Source of Stimulus
- ii) Environment
- iii) Artifact

(03 Marks)

d) Consider a Video Conferencing Product like “Google Meet”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Video Conferencing Product.

(03 Marks)

Q No 2 a) a) Consider a typical “Online Hostel Management System”. (6)

Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes.

(02 Marks)

b) Draw a Use Case Diagram for a typical “Online Hospital Management System” using full and correct notations. Your should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

- Q No 3 a) a) Give a non-software example for the Adapter pattern. (15)
Explain how the Adapter Pattern works using above non-software example.
(02 Marks)
- b) Why Factory Method Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages/applicability of Factory Method Pattern.)
(03 Marks)
- c) Explain the Motivation of Observer Design Pattern with example.
(02 Marks)
- d) Justify the need/use/importance of Mediator Pattern with the help of its advantages/consequences.
(03 Marks)
- e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)
- f) Why Model View Controller (MVC) Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages of MVC Pattern.)
(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical " Online Placement system of the College ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void numcheck(int i){  
    while (i<10) {  
        System.out.println("i is %d", i);  
        if (i%2 == 0)  
            System.out.println("even");  
        else  
            System.out.println("odd");  
        i=i+1;    }  
    }
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Why Black box Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Create account” on “Social Networking site like LinkedIn”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Incremental model of software development.

(13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

i) Module Structures

ii) Component-and-connector Structures

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Pause/Resume

ii) Aggregate

(03 Marks)

d) Consider a typical “Online College Portal”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online College Portal.

(03 Marks)

Q No 2 a) a) For a typical “Online Airline Reservation System”, consider (6)
a use case "Cancel Ticket". For the implementation of this use
case, identify and give ONE relevant example for ANY 2 types
of classes from the following:

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Consider a use case “Take an appointment” for a typical
“Online Hospital Management System”. For this use case,
Draw an ACTIVITY DIAGRAM using full and correct
notations. Your diagram must show use of “Branch and
Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.

(04 Marks)

- Q No 3 a) a) Write on the Applicability/use of the Factory Method Design ⁽¹⁵⁾ Pattern.
(02 Marks)
- b) Why Adapter Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages/applicability of Adapter Pattern.)
(03 Marks)
- c) What is the Intent of Observer Design Pattern? Enlist all the Participants of Observer Pattern.
(02 Marks)
- d) Justify the need/use/importance of Observer Pattern with the discussion on its advantages/consequences/applicability.
(03 Marks)
- e) In the context of Model View Controller (MVC) Pattern, explain the roles of Model and Controller.
(02 Marks)
- f) When one can iterate over a linked list or an array by using *ptr --> next* or *i++*, why do we need an Iterator pattern? What are the advantages of Iterator pattern?
(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical "Online Movie Ticket Booking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
IF A = 354
THEN IF B > C
    THEN A = B
    ELSE A = C
    END IF
END IF
PRINT A
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths,** for the drawn graph. **Write down the Test cases covering the identified independent paths.**
(04 Marks)

Unit-5

Q No 5 a) a) What is the importance of testing? Justify. (9)
(03 Marks)

b) Given a typical use case “Place an Order” for “Online Store for Medical Supplies”. For this use case, **write the use case template.** (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Incremental model of software development.

(13)

(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

i) Non-Functional requirements

ii) Product Perspective

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Cancel

ii) Maintain Task Model

(03 Marks)

d) Consider a Document Editing Product like “MS Word”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Document Editing Product.

(03 Marks)

Q No 2 a) a) Consider a typical “College Library Management System”. (6)

For this system, identify ANY ONE CLASS with a detailed list of attributes and operations.

Write the full specification of the identified CLASS with full UML notation, having the compartments showing the list of:

i) Attribute

ii) Operations with full signature and stereotypes

(02 Marks)

b) Draw a Use Case Diagram for a typical “Hostel Management System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

- Q No 3 a) a) Give a non-software example for the Factory Method pattern. ⁽¹⁵⁾
Explain how the Factory Method pattern works using above non-software example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Explain the role of each of the Participants in Mediator pattern.
(02 Marks)
- d) Why Observer Pattern and Mediator Pattern are called as related patterns? What are the similarities and differences between these two above patterns?
(Hint: Make use of design pattern fields like Intent, Motivation, Applicability etc. to answer above two questions.)
(03 Marks)
- e) Write on the Applicability/use of the Iterator Design Pattern.
(02 Marks)
- f) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Model View Controller (MVC) Pattern with the help of its advantages, in the above example.
(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical "Online Movie Ticket Booking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
IF A = 354
THEN IF B > C
    THEN A = B
    ELSE A = C
    END IF
END IF
PRINT A
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths,** for the drawn graph. **Write down the Test cases covering the identified independent paths.**
(04 Marks)

Unit-5

Q No 5 a) a) Why Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Book Ticket” for “Online Airline Reservation System”. For this use case, **write the use case template.** (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why “Software Architecture” is an important stage/activity/phase in the development of any Software? (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

i) Module Structures

ii) Allocation Structures

(04 Marks)

c) Explain with examples, ANY TWO tactics for Usability. (03 Marks)

d) Consider an Online Email Service like “Gmail”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Email Service.

(03 Marks)

Unit-2

Q No 2 a) a) Consider a typical “Online College Admission System”. Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes. (6)

(02 Marks)

b) Draw a Use Case Diagram for a typical “Online Hotel Management System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

Unit-3

Q No 3 a) a) Explain the role of each of the Participants in Adapter pattern.
(02 Marks)

(15)

b) Justify the need/use/importance of Factory Method Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

c) Give a non-software example for the Mediator pattern. Explain how the Mediator pattern works using above non-software example.
(02 Marks)

d) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Observer Pattern with the help of its advantages, in the above example.
(03 Marks)

e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)

f) When one can iterate over a linked list or an array by using *ptr --> next* or *i++*, why do we need an Iterator pattern? What are the advantages of Iterator pattern?
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) What is the importance of testing? Justify.

(9)

(03 Marks)

b) Given a typical use case “Place an Order” for “Online Store for Medical Supplies”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)

(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.

(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

- Q No 1 a) a) Justify the importance of “Software Architecture” in the development of any software. (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (03 Marks) (13)
- b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.
- i) Functional requirements
 - ii) External interfaces
- (04 Marks)
- c) In the context of general scenario of Usability, explain the following terms.
- i) Source of Stimulus
 - ii) Response Measure
 - iii) Artifact
- (03 Marks)
- d) Consider a Search Engine like “Google”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Search Engine application. (03 Marks)

Q No 2 a) a) Consider a hypothetical “University Examination System”. (6)

For this system, identify ANY ONE CLASS with a detailed list of attributes and operations.

Write the full specification of the identified CLASS with full UML notation, having the compartments showing the list of:

i) Attributes

ii) Operations with full signature and stereotypes

(02 Marks)

b) Consider a use case “Book a Room” for a typical “Online Hotel Management System”. For this use case, Draw an ACTIVITY DIAGRAM using full and correct notations. Your diagram must show use of “Branch and Merge” and “Fork and Join” concepts (using full & correct notations). Make suitable assumptions about the scope of the above system.

(04 Marks)

- Q No 3 a) a) Explain the Motivation of Factory Method Design Pattern with example. (15)
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Give a non-software example for the Observer pattern. Explain how the Observer pattern works using above non-software example.
(02 Marks)
- d) Why Mediator Pattern is needed? Justify with example.
(Hint: Your answer should be based on advantages/applicability of Mediator Pattern.)
(03 Marks)
- e) What is the Intent of Iterator Design Pattern? Draw a neat diagram for “Class Structure” of Iterator pattern.
(02 Marks)
- f) Justify the need/use/importance of Iterator Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical "Online Shopping website". Identify and write ANY TWO test cases for this website by applying ANY ONE of the Black Box Testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) Make suitable assumptions about the functionality of the above website.

(02 Marks)

c) Consider a code fragment as given below:

```
a = b
c = 0
while (a > 1) {
    If (a^2 > c)
        c = c + a
        a = a - 2
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.

(04 Marks)

Unit-5

Q No 5 a) a) What is the importance of testing? Justify.
(03 Marks)

(9)

b) Given a typical use case "Place an Order" for "Online Store for Medical Supplies". For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)

(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



CUMMINS COLLEGE OF ENGINEERING FOR WOMEN

**(An Autonomous Institute affiliated to Savitribai Phule Pune
University)**

Third Year Computer

SOFTWARE DESIGN AND ARCHITECTURE (CE3203)

Duration : 02:00 Hours

Max Marks : 50

Instructions :

1. All questions are compulsory.
2. Please read each question carefully.
3. **SHORT, PRECISE and CONCISE answers are expected.**
4. The ANSWER must be clear, lucid and SPECIFIC TO the QUESTION asked.
5. Most questions are based on hypothetical systems / examples. MAKE SUITABLE ASSUMPTIONS about scope of such systems / examples, wherever relevant. (IMPORTANT INSTRUCTION)
6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

- Q No 1 a) a) Compare and Contrast Waterfall model of software development and Iterative model of software development. (03 Marks) (13)
- b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.
- i) Product Scope
 - ii) Design and Implementation Constraints
- (04 Marks)
- c) Explain with examples, each of the following tactics for Usability.
- i) Undo
 - ii) Maintain User Model
- (03 Marks)
- d) Consider an Online Chat Application like “WhatsApp”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Chat Application. (03 Marks)

Q No 2 a) a) Consider a typical “College Library Management System”. (6)

For this system, identify ANY ONE CLASS with a detailed list of attributes and operations.

Write the full specification of the identified CLASS with full UML notation, having the compartments showing the list of:

i) Attribute

ii) Operations with full signature and stereotypes

(02 Marks)

b) Draw a Use Case Diagram for a typical “Hostel Management System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

Q No 3 a) a) Explain the role of each of the Participants in Adapter pattern.
(02 Marks)

(15)

b) Justify the need/use/importance of Factory Method Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

c) Give a non-software example for the Mediator pattern. Explain how the Mediator pattern works using above non-software example.
(02 Marks)

d) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Observer Pattern with the help of its advantages, in the above example.
(03 Marks)

e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)

f) When one can iterate over a linked list or an array by using *ptr --> next* or *i++*, why do we need an Iterator pattern? What are the advantages of Iterator pattern?
(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical " Online Placement system of the College ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void numcheck(int i){  
    while (i<10) {  
        System.out.println("i is %d", i);  
        if (i%2 == 0)  
            System.out.println("even");  
        else  
            System.out.println("odd");  
        i=i+1;    }  
    }
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) What is the importance of testing? Justify.

(9)

(03 Marks)

b) Given a typical use case “Place an Order” for “Online Store for Medical Supplies”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)

(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.

(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why Iterative model is advantageous over the Waterfall model for software Development? (Hint: Your answer should be based on limitations of Waterfall model and advantages of Iterative model.) (13)

(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

- i) Functional requirements
 - ii) Operating Environment
- (04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Response
 - ii) Stimulus
 - iii) Response Measure
- (03 Marks)

d) Consider a Presentation Software like “MS Power Point”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Presentation Software.

(03 Marks)

Q No 2 a) a) For a typical “Online Airline Reservation System”, consider (6)
a use case "Cancel Ticket". For the implementation of this use
case, identify and give ONE relevant example for ANY 2 types
of classes from the following:

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Consider a use case “Take an appointment” for a typical
“Online Hospital Management System”. For this use case,
Draw an ACTIVITY DIAGRAM using full and correct
notations. Your diagram must show use of “Branch and
Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.

(04 Marks)

- Q No 3 a) a) Explain the Motivation of Factory Method Design Pattern (15)
with example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Give a non-software example for the Observer pattern. Explain how the Observer pattern works using above non-software example.
(02 Marks)
- d) Why Mediator Pattern is needed? Justify with example.
(Hint: Your answer should be based on advantages/applicability of Mediator Pattern.)
(03 Marks)
- e) What is the Intent of Iterator Design Pattern? Draw a neat diagram for “Class Structure” of Iterator pattern.
(02 Marks)
- f) Justify the need/use/importance of Iterator Pattern with the help of its advantages/consequences/applicability.
(03 Marks)

Q No 4 a) a) What do you mean by “Boundary Value Analysis (BVA)”? (7)
(01 Mark)

b) Consider a typical "Online Movie Ticket Booking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
IF A = 354
THEN IF B > C
    THEN A = B
    ELSE A = C
    END IF
END IF
PRINT A
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths,** for the drawn graph. **Write down the Test cases covering the identified independent paths.**
(04 Marks)

Unit-5

Q No 5 a) a) Differentiate between Validation and Verification. (9)
(03 Marks)

b) Given a typical use case “Withdraw Money from ATM”. For this use case, **write the use case template.** (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why “Software Architecture” is an important stage/activity/phase in the development of any Software? (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

i) Module Structures

ii) Allocation Structures

(04 Marks)

c) Explain with examples, ANY TWO tactics for Usability. (03 Marks)

d) Consider an Online Email Service like “Gmail”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Email Service.

(03 Marks)

Unit-2

Q No 2 a) a) For a typical “College Library Management System”, consider a use case “Borrow a book”. For the implementation of this use case, identify and give ONE relevant example for ANY 2 types of classes from the following: (6)

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Draw a Use Case Diagram for a typical “Movie Ticket Booking System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

Unit-3

- Q No 3 a) a) Give a non-software example for the Factory Method pattern. (15)
Explain how the Factory Method pattern works using above non-software example.
(02 Marks)
- b) Justify the need/use/importance of Adapter Pattern with the help of its advantages/consequences/applicability.
(03 Marks)
- c) Explain the role of each of the Participants in Mediator pattern.
(02 Marks)
- d) Why Observer Pattern and Mediator Pattern are called as related patterns? What are the similarities and differences between these two above patterns?
(Hint: Make use of design pattern fields like Intent, Motivation, Applicability etc. to answer above two questions.)
(03 Marks)
- e) Write on the Applicability/use of the Iterator Design Pattern.
(02 Marks)
- f) Consider an Examination system, which needs to show Bar and Pie charts for examination results. Make suitable assumptions. Justify the need/use of Model View Controller (MVC) Pattern with the help of its advantages, in the above example.
(03 Marks)

Q No 4 a) a) What do you mean by a “Test case”?
(01 Mark)

(7)

b) Consider a typical "Online Banking System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.

(02 Marks)

c) Consider a code fragment as given below.

```
int main()
{
    int n1, n2
    printf("Enter two positive integers: ");
    scanf("%d %d",&n1,&n2)
    while(n1!=n2) {
        if(n1 > n2)
            n1= n1-n2;
        else n2 = n2- n1;
    }
    printf("GCD = %d",n1); }
```

For the above code fragment, **Draw the Control Flow Graph.** Also, **Identify and list down all the Independent Paths**, for the drawn graph. **Write down the Test cases covering the identified independent paths.**

(04 Marks)

Q No 5 a) a) Why Black box Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Create account” on “Social Networking site like LinkedIn”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why Incremental model is advantageous over the Waterfall model for Software Development? (Hint: Your answer should be based on limitations of Waterfall model and advantages of Incremental model.) (13)
(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

- i) Non-functional requirements
- ii) External interfaces

(04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Source of Stimulus
- ii) Environment
- iii) Artifact

(03 Marks)

d) Consider a Video Conferencing Product like “Google Meet”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Video Conferencing Product.

(03 Marks)

Q No 2 a) a) Consider a typical “College Library Management System”. (6)

Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes.

(02 Marks)

b) Draw an Activity Diagram for “Making Tea” using full and correct notations. Your diagram must show use of “Fork and Join” and “Branch and Merge” concepts (using full & correct notations). Make suitable assumptions about scope.

(04 Marks)

Unit-3

Q No 3 a) a) What is the Intent of Factory Method Design Pattern? Draw (15)
a neat diagram for “Class Structure” of Factory Method pattern.
(02 Marks)

b) Why Adapter Pattern is needed? Justify with example.
(Hint: Your answer should be based on
advantages/applicability of Adapter Pattern.)
(03 Marks)

c) Explain the Motivation of Mediator Design Pattern with
example.
(02 Marks)

d) Justify the need/use/importance of Observer Pattern with the
help of its advantages/consequences/applicability.
(03 Marks)

e) Explain the advantages of Model View Controller (MVC)
Pattern.
(02 Marks)

f) Why Iterator Pattern is needed? Justify with example.

(Hint: Your answer should be based on
advantages/applicability of Iterator Pattern.)
(03 Marks)

Q No 4 a) a) What do you mean by a “Test case”?
(01 Marks)

(7)

b) Consider a typical " Online Food Ordering System ".
Identify and write ANY TWO test cases for this system by
applying ANY ONE of the Black Box testing techniques. (Hint:
Equivalence Class Partitioning and/or Boundary Value
Analysis.) make suitable assumptions about the functionality of
the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
int main()
{
    int a;
    scanf("%d",&a);
    if(a>10)
        if (a<20 )
            printf("10<a<20 %dn", a);
        else
            printf("a>=20 %dn", a);
    else
        printf("a<=10 %dn", a);
}
```

For the above code fragment, **Draw the Control Flow Graph.**
Compute the Cyclomatic Complexity of the graph. Also,
Identify and list down all the Independent Paths, for the
drawn graph.
(04 Marks)

Q No 5 a) a) Why Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Book Ticket” for “Online Airline Reservation System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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6. Draw neat diagrams wherever necessary.
7. Please Manage/Plan your time carefully for All Questions.

Unit-1

Q No 1 a) a) Why “Software Architecture” is an important stage/activity/phase in the development of any Software? (Hint: Your answer should be based on discussions on various advantages/use of Software Architecture, for example “achieving quality attributes” etc.) (13)

(03 Marks)

b) In the context of Software Architecture, explain the following terms with examples.

- i) Allocation Structures
 - ii) Component-and-connector Structures
- (04 Marks)

c) In the context of general scenario of Usability, explain the following terms.

- i) Stimulus
 - ii) Response
 - iii) Environment
- (03 Marks)

d) Consider a Document Editing Product like “MS Word”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Document Editing Product.

(03 Marks)

Q No 2 a) a) For a typical “Online Airline Reservation System”, consider (6)
a use case "Cancel Ticket". For the implementation of this use
case, identify and give ONE relevant example for ANY 2 types
of classes from the following:

Boundary classes, Entity classes, Control Classes

(02 Marks)

b) Consider a use case “Take an appointment” for a typical
“Online Hospital Management System”. For this use case,
Draw an ACTIVITY DIAGRAM using full and correct
notations. Your diagram must show use of “Branch and
Merge” and “Fork and Join” concepts (using full & correct
notations). Make suitable assumptions about the scope of the
above system.

(04 Marks)

Q No 3 a) Explain the Motivation of Adapter Design Pattern with example.

(02 Marks)

b) Justify the need/use/importance of Factory Method Pattern with the help of its advantages/consequences/applicability.

(03 Marks)

c) Explain the role of each of the Participants in Mediator pattern.

(02 Marks)

d) Why Observer Pattern is needed? Justify with example.

(Hint: Your answer should be based on advantages/applicability/consequences of Observer Pattern.)

(03 Marks)

e) Give a non-software example for the Iterator pattern. Explain how the Iterator Pattern works using above non-software example.

(02 Marks)

f) Justify the need/use/importance of Model View Controller (MVC) Pattern with the help of its advantages.

(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Compare and Contrast the Black box testing and White box testing. (9)
(03 Marks)

b) Given a typical use case "Issue book" for “College Book Library Management System”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)



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Unit-1

Q No 1 a) a) Compare and Contrast Waterfall model of software development and Iterative model of software development. (13)
(03 Marks)

b) In the context of Software Requirement Specification (SRS), explain the following terms/concepts with examples, from any application of your choice.

i) Product Scope

ii) Design and Implementation Constraints

(04 Marks)

c) Explain with examples, each of the following tactics for Usability.

i) Undo

ii) Maintain User Model

(03 Marks)

d) Consider an Online Chat Application like “WhatsApp”. Justify the importance of “Usability” quality attribute by writing on ANY THREE suitable examples of “User-friendly factors (Usability)” with respect to above Online Chat Application.

(03 Marks)

Unit-2

Q No 2 a) a) Consider a typical “Online College Admission System”. (6)
Assume that system will be implemented using object-oriented classes. For this system, illustrate with ANY ONE appropriate example, the Generalization - Specialization relationship amongst the classes.

(02 Marks)

b) Draw a Use Case Diagram for a typical “Online Hotel Management System” using full and correct notations. Your diagram should include at least ONE example of <<include>> relationship in above system. Make suitable assumptions about scope of the above system.

(04 Marks)

Unit-3

- Q No 3 a) a) Give a non-software example for the Adapter pattern. (15)
Explain how the Adapter Pattern works using above non-software example.
(02 Marks)
- b) Why Factory Method Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages/applicability of Factory Method Pattern.)
(03 Marks)
- c) Explain the Motivation of Observer Design Pattern with example.
(02 Marks)
- d) Justify the need/use/importance of Mediator Pattern with the help of its advantages/consequences.
(03 Marks)
- e) What methods are there in Iterator interface or class? What is the purpose of each method?
(02 Marks)
- f) Why Model View Controller (MVC) Pattern is needed? Justify with example. (Hint: Your answer should be based on advantages of MVC Pattern.)
(03 Marks)

Q No 4 a) a) What are Equivalence Classes?
(01 Mark)

(7)

b) Consider a typical " Online College Examination Management System ". Identify and write ANY TWO test cases for this system by applying ANY ONE of the Black Box testing techniques. (Hint: Equivalence Class Partitioning and/or Boundary Value Analysis.) make suitable assumptions about the functionality of the above system.
(02 Marks)

c) Consider a code fragment as given below.

```
public void check(int x) {  
    while(x<20){  
        System.out.println("x is %d", x);  
        if (x % 3 == 0)  
            System.out.println ("divisible by 3");  
        else  
            System.out.println ("not divisible by 3");  
        x=x+1;    }  
}
```

For the above code fragment, **Draw the Control Flow Graph. Compute the Cyclomatic Complexity** of the graph. Also, **Identify and list down all the Independent Paths**, for the drawn graph.
(04 Marks)

Q No 5 a) a) Why Black box Testing is important? Give two significant reasons of the same. (9)
(03 Marks)

b) Given a typical use case “Create account” on “Social Networking site like LinkedIn”. For this use case, **write the use case template**. (Hint: use case template contains fields like pre and post conditions, main and alternative flows etc.)
(03 Marks)

Identify / generate ANY THREE test cases from the above use case template and write the description of these three test cases.
(03 Marks)