National University of Computer and Emerging Sciences
Islamabad Campus

Software Design and Analysis (CS3004)

Course Instructor(s):
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Section(s): (A,B,C,D,E,F,G)
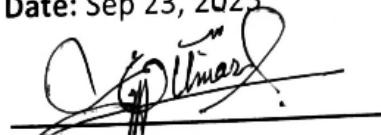
Sessional-I Exam

Total Time (Hrs):	1
Total Marks:	40
Total Questions:	3

Date: Sep 23, 2025

Student Signature

Roll No _____   Course Section _____

Do not write below this line.

Attempt all the questions.

[CLO 1: To understand the requirement engineering with analysis]

Q1: Select the correct option for given MCQS and fill the table below. [10 marks]

1. Which of the following are valid requirements?
1. The system shall allow customers to book tickets online.
2. The database must be implemented in MySQL. ✗
3. The system shall notify customers by email after a successful booking.
4. Developers must use GitHub for version control ✗
(A) 1 and 2   (B) 1 and 3 ✓   (C) 2 and 4
(D) 1, 2 and 3   (E) All of them

2. In 3-tier architecture, the middle tier is responsible for:
(A) Rendering user interface   (B) Storing persistent data
(C) Implementing business logic ✓   (D) Managing operating system calls   (E) None of the above

3. Who is accountable for maximizing the value of the product resulting from the Scrum Team's work?
(A) Scrum Master ✓   (B) Development Team   (C) Product Owner
(D) Stakeholders   (E) Project Manager   (E) All of them

4. Which of these is correct way of inheriting class A by class B?
(A) class B + class A {}   (B) class B inherits class A {}
(C) class B extends A {} ✓   (D) class B extends class A {}   (E) All of them

5. Which of the following is not allowed in an interface in java programming?
(A) Default methods   (B) static methods   (C) private methods
(D) Instance variables   (E) public abstract methods

6. Which of the following activities is NOT a part of requirements engineering process?

(A) Elicitation   (B) Specification   (C) Validation
(D) Verification   (E) Management

7. Consider the following activities.
(i) Transforming the 'Analysis' Use cases to 'Design' Use cases.
(ii) Identify class attributes, class behaviours and responsibilities.
(iii) Model object states.
Which of above statements is/are activities of Object-Oriented Design?
(A) Only (i)   (B) Only (ii)   (C) Only (ii) and (iii)   (D) Only (i) and (iii)   (E) All

8. Consider the following statements with regard to Software Development Processes.
(i) The main goals of the elaboration phase in Unified Process are to develop an understanding of the problem domain, establish an architectural framework for the system, develop the project plan and identify key project risks.
(ii) Reuse-oriented approaches rely on a large base of reusable software components and an integrating framework for the composition of these components.
(iii) Agile methods universally rely on an incremental approach to software specification, development and delivery.
Which of the above statements is/are correct?
(A) Only (i)   (B) Only (ii)   (C) Only (i) and (iii)   (D) Only (i) and (ii)   (E) All

9. Consider the following statements with respect to Use case modeling.
(i) When one needs to model things that happen to the system at a specific point in time but which do not seem to be triggered by an actor, he can introduce an actor called Time.
(ii) Use cases are always initiated by an actor.
(iii) To find use cases, one can ask the questions "How does each actor use the system?" and "What does the system do for each actor?"
Which of the above statements is/are correct?
(A) Only (i)   (B) Only (ii)   (C) Only (i) and (ii)   (D) Only (ii) and (iii)   (E) All
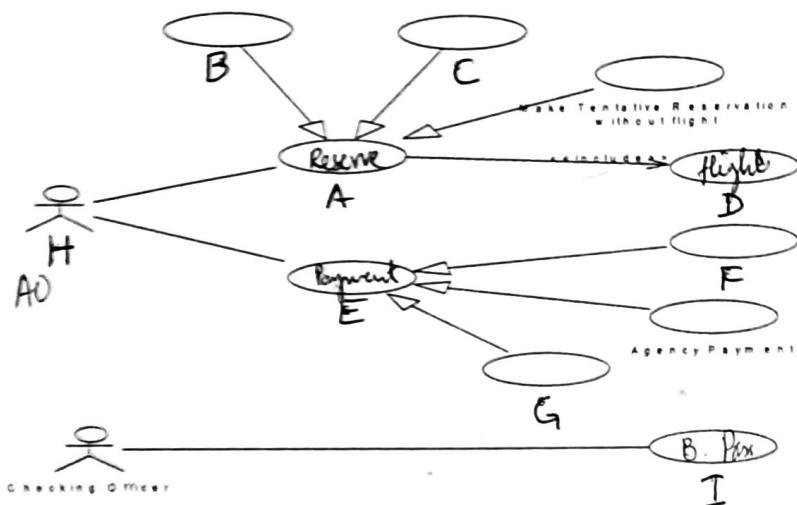
10. What is meant by the term 'software crisis'?
(A) Ability to deliver software on time with good quality
(B) A situation in which experienced developers leave the company
(C) Inability of new software to inter-operate with existing software
(D) Instability in the development team
(E) A situation in which large-scale software projects took more time and budget than was planned.

MCQS #	Correct Option
1	B
2	C
3	A
4	C
5	E
6	D
7	B
8	B
9	C
10	C

Option	Correct use case/Actor
A	Make Reservation
B	Make Block Reservation
C	Make Tentative Reservation With Flight
D	Check Available Flights
E	Make Payment
F	Cash Payment
G	Credit Payment
H	Airline Officer
I	Issue Boarding Pass

(b)Define an interface Payment Mode with a method apply Discount (double fare). [9 marks]

Implement the following classes by using proper and complete java code: Demonstrate **runtime polymorphism** by processing different payment modes through a common reference in main.

1. Cash Payment (no discount)
2. TravelersChequePayment (2% discount)
3. CreditCardPayment (3% discount)

(c) Justify whether "Agency" is a primary actor or a secondary actor. [2 marks]

[CLO 3: To apply design artifacts using real-life scenario]

Q3: Based on the following scenario answer the questions. [10 marks]

Initially, customers purchased items with an invoice. After a few days, he/ she wants to return some of the purchased items.

(a) Write down Iterations (in bullets) of return of purchased Items when customer arrives at store's counter.
(b) Draw Use Case Diagram of your iterations.

[CLO 2: To manage analysis and design artifacts]

Q2: Based on the following case study answer questions given below.   [20 marks]

The following text describes the operations of an Airline Reservation System:

Reservations can be done by individuals or by agencies (type of customer). For block bookings, which are done by agencies, discounts are given.

When a customer wants to make a reservation, at the airline office, the airline officer will take notes of the date of departure, the departure point, destination point and the class the customer wishes to travel in to check the availability of a flight. If a flight is available according to the customer's requirements, a confirmed reservation is made under the customer's name by taking the following particulars. Customer's name, Passport Number and contact number(s).

After making the reservation, the customer is informed of the flight number and departure time with the routes of the reserved flight.

A route can be defined as a point-to-point journey between the reservation's starting point and the final destination. There may be some stopovers. As a result, different flights may be used to reach the reservation's final destination. Hence, a reservation may not necessarily take a direct flight to the final destination. The type of aircraft is fixed for each point-to-point journey. Same flight may involve several stopovers and the same or different aircraft may be used for the next succeeding stage.

If a flight is not available according to the requirements of the customer, the customer is requested to make a tentative reservation for that specific flight. If the customer agrees, a tentative reservation is made for him and the customer is informed of the flight number, departure date and time with the routes of that flight.

If the customer wants to leave on a specific date and if he agrees with any flight as long as it leaves on that date, the reservation is made tentatively without any flight attached.

The individual customers are required to pay 50% of the fare as an advanced payment when they reserve a flight but this is not applicable to block bookings done by agencies.

The fare depends on the following factors.

Type of seat class, Type of customer, Flight

Individuals are required to pay the balance amount when they come to the airline office to collect the ticket. Agencies have to settle the payment within a duration of one month from the date of reservation. Discounts are also given for different payment modes.

They are as follows:

Payment Modes	Discount
Cash	No discount
Traveller's Cheque	e.g. 2% Thomas Cook
Credit Card	e.g. 3% Diners etc.
Block Booking	Depend on the agency.

Finally, when a customer checks in at the airport of departure, the checking officer gives a boarding pass to the customer comprising the following information.

Flight number, Seat number, Boarding gate and time

(a) Following is a Use Case diagram for the given system: [9 marks]
Identify the Actors/Use Cases for labels A-I from given list and fill the correct answer in given table.

Make Block Reservation, Check Available flights, Make Payment, Airline officer, Make Reservation, Issue Boarding Pass, Cash Payment, Credit Payment, Make tentative Reservation with flight.