Roll Number: _____

Thapar Institute of Engineering and Technology, Patiala

Department of Computer Science and Engineering

BE COE (Summer Semester) EST ***UCS503/ULC605*: Software Engineering**

23rd July 2025 (9:00 am – 12:00 noon)

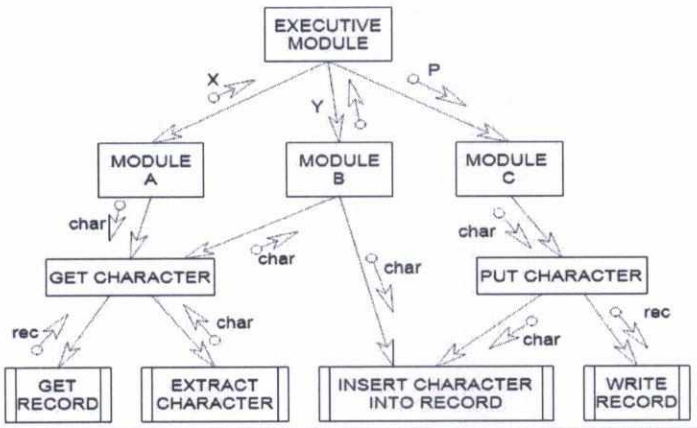
Time: 3 Hrs. MM: 40 Name of Faculty: Dr. Harkiran Kaur

Note: Attempt any four questions. Attempt all parts of a question together. For the numerical questions, writing formulae and step wise computation is compulsory

S.No.	Questions	Marks	CO	BL
Q.1	(a) A bank operates an ATM system that allows users to withdraw money from their accounts. The typical withdrawal process is as follows: A Customer inserts their ATM card. The ATM prompts the user to enter their PIN. The PIN is sent to the Bank Server for validation. If the PIN is correct, the customer is asked to enter the withdrawal amount. The ATM sends a transaction request to the bank server to check the balance and process the withdrawal. The bank server verifies the account balance, updates it, and approves the transaction. The ATM dispenses the cash. A receipt is printed. The transaction is logged by the bank. The ATM ejects the card and ends the session. Draw a ***Sequence Diagram*** for the "Withdraw Cash" function of the ATM system.	(6)	CO2	L4
	(b) Describe the Scrum methodology process flow used in Agile software development. Draw the diagram to support your explanation.	(4)	CO1	L2

Q.2	(a) Consider the following C++ code snippet and answer the following:
	1. void checkNumbers(int a, int b, int c) {
	2. if (a > b) {
	3. cout << "a is greater than b" << endl;
	4. } else if (b > c) {
	5. cout << "b is greater than c" << endl;
	6. } else {
	7. cout << "c is the greatest" << endl;
	8. }
	9. while (a < c) {
	10. a += 1;
	11. if (a == b) {
	continue; }
	12. cout << a << " ";
	13. }
	14. switch (c) {
	15. case 1: cout << "One" << endl; break;
	16. case 2: cout << "Two" << endl; break;
	17. default: cout << "Other" << endl; }
	18. }
	(i) Write all the Independent Paths for this code snippet
	(ii) Draw the Control Flow Graph
	(iii) Calculate the Cyclomatic Complexity (Write formulae also)
		
		(2)
		(2)
		(2)
			CO4	L3

	(b) For an online Hotel Room Booking System, users can book between 1 to 5 rooms per reservation. The system should reject invalid room quantities and ensure proper handling of valid ones. Write the best set of Equivalence Class and Boundary Value test cases to test this functionality.	(4)		
Q.3	(a) You are given the following precedence table for a software development project: **Activity** | **Description** | **Duration (Days)** | **Immediate Predecessors** A | Requirements Analysis | 3 | — B | System Design | 5 | A C | UI Design | 4 | A D | Database Design | 6 | B E | UI Implementation | 5 | C F | Backend Development | 8 | D G | Integration Testing | 4 | E, F H | Final Review | 2 | G (i) Draw the Activity-on-Arc (AOA) Network Diagram. Calculate the Earliest Start (ES), Earliest Finish (EF), Late Start (LS), and Latest Finish (LF) for each activity (Showing Forward Pass & Backward Pass) (ii) Mention the slack time for all activities (iii) Highlight the critical path and the project completion time (b) A software development project is estimated to be 350 KLOC. The development team is new and lacks prior experience. The schedule is tight, and there is significant innovation in the project. Calculate the effort, development time, average staff size, and productivity.	(3) (2) (1) (4)	CO5	L4 L3
Q.4	(a) A startup is building an Online Food Ordering Platform where users can browse restaurants, place food orders, and get them delivered. The system supports the following: Customers can register, log in, browse restaurants, view menus, place orders, and make payments. A Restaurant has a name, location, contact details, and a list of MenuItems (each with name, description, and price). Orders include one or more menu items, the total amount, order status, and timestamps (order time, delivery time). DeliveryPersonnel deliver the orders. Each delivery person has an ID, name, contact info, and status (available/busy). Payment can be done via credit card, debit card, or wallet. The system records payment ID, type, and status. A customer can track the delivery status in real-time. The system should also maintain feedback from customers for restaurants and delivery personnel. Draw a UML ***Class Diagram*** for the Online Food Ordering System based on the given scenario. (b) Differentiate between following concepts of the Swimlane Diagram: (i) Merge Diamond vs Decision Diamond (ii) Fork vs Join	(6) (2*2 = 4)	CO2	L4 L2

Q.5	(a) Differentiate between the following in context of Software Design: (i) Pipe & Filter vs Data-Centred architectural styles (ii) Object Oriented Design vs Service Oriented Design (b) For the given Module Structure Chart, answer for the following: (i) Fan-in of module 'INSERT CHARACTER INTO RECORD' (ii) Depth of Tree (iii) Fan – out of module 'PUT CHARACTER' (iv) Fan-in of module 'GET RECORD'  	(6) (4)	CO3	L2 L4