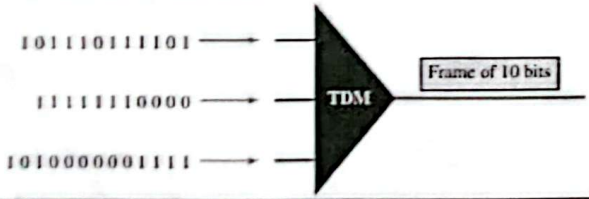
Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Term Examination, Spring 2025
Course Code: CSE 225, Course Title: Data Communication
Level:2 Term:2 Batch: 65

Time: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1	a)	Which of the modulation techniques vary its phase to determine 0 and 1? **Analyze** the possible advantages, limitations and applications of such modulation?	3	CO3
	b)	**Calculate** the number of bits per baud for the following techniques? a. ASK with four different amplitudes b. FSK with eight different frequencies c. PSK with four different phases d. QAM with a constellation of 128 points	4	
	c)	**Calculate** the narrow bandwidth for the following situations if we need to modulate a 7-KHz voice. a. AM b. FM c. PM	3	
2.	a)	Why do we need data rate management to achieve multiplexing? What kind of changes should be imposed in input data rates to achieve multiplexing? **Analyze** your understanding with appropriate figure.	3	CO3
	b)	Figure shows a multiplexer in a synchronous TDM system. Each output slot is only 10 bits long (3 bits taken from each input plus 1 framing bit). **Analyze and illustrate** the output stream. The bits arrive at the multiplexer as shown by the arrows. 	3	
	c)	We need to use synchronous TDM and combine 20 digital sources, each of 100 Kbps. Each output slot carries 1 bit from each digital source, but one extra bit is added to each frame for synchronization. **Investigate** the following questions:	4	

		a. What is the size of an output frame in bits? b. What is the output frame rate? c. What is the duration of an output frame? d. What is the output data rate?		
3	a)	Suppose, the dividend = 101000111 and the divisor = 1101. **Inspect** the polynomial CRC. Also **Inspect** the CRC has no error.	4	CO4
	b)	Suppose you have the following bits to send (in decimal): 6, 12, 10, 7, and 2. **Inspect** the checksum.	4	
	c)	How the single-bit error differ from a burst error? **Differentiate** with appropriate figure.	2	
4	a)	Why slotted ALOHA is better than pure ALOHA? **Identify** your logic.	3	CO4
	b)	In the reservation method, "a station needs to make a reservation before sending data". **Analyze** the statement.	3	
	c)	Suppose you have 4 stations (A, B, C and D). B, C are sending 0, D and A is sending 1. Demonstrate your **calculation and discover** the CDMA multiplexing values using Walsh table.	4	

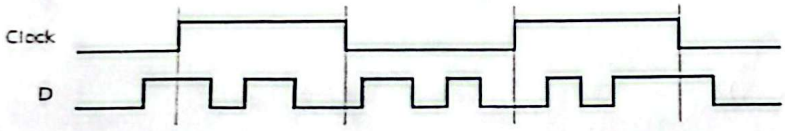
Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Semester Examination, Spring 2025
Course Code: CSE223, Course Title: Digital Logic Design
Level: 2 Term: 2 Batch: 65

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions [Optional]

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	The priority levels of four inputs of a 4 to 2 priority encoder are given by w2 > w3 > w1> w0. Using truth table and logic equations design the logic Circuit for priority encoder.	5	CO3
	b)	Implement the Boolean function F (x_1, x_2, x_3, x_4) = Σ (0, 2, 5, 7, 8, 10, 13, 15) with a Multiplexer. Assume x_1, x_3 and x_4 are connected with selection lines.	5	
2.	*a)*	For the following input draw the output waveforms Q & Q' for a D flip-flop. Consider, Initially the flip-flop is in reset state. 	5	CO4
	b)	Design a 4-bit serial in the parallel-out shift register.	5	
3.	*a)*	Define synchronous and asynchronous counters. Design a three-bit up/down counter using T flip-flops. It should include a control input called UP /Down. If UP /Down = 0, then the circuit should behave as an up counter. If UP /Down = 1 then the circuit should behave as a down-counter.	5	CO4
	b)	Create a comparison table that highlights the key differences and applications between RAM and ROM, considering their characteristics, advantages, and limitations.	5	
	C)	A smart home system is designed to automatically control the room Light and Fan. The system should activate the lights and fan based on the following conditions: Condition 1: Light(A, B, C) = $\sum$**m(0, 1, 2, 4)** Condition 2: Fan(A, B, C) = $\sum$ **m(0, 5, 6, 7)** Construct the PLA implementation for the Lights and Fan functions.	10	

Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Examination, Spring 2025

Course Code: CSE228, Course Title: Theory of Computation

Level: L2 Term: T2 Batch: 65

Time: 02:00 Hrs **Marks:40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

Q1	**a)**	Apply the concept of Pushdown Automata (PDA) to **discover** a PDA that accepts the language $L = \{0^n1^{2n} \mid n \geq 1\}$ and **Analyze** that the string **000111111 is accepted**	**[6]**	**CO3**
	b)	Consider the following PDA: $P = (\{q0, q1, q2, q3, q4, f\}, \{a,b\}, \{Z0, A, B\}, \delta, q0, Z0, \{f\})$. The transition functions are given below: 1. $\delta(q0, a, Z0) = (q1, AAZ0)$ 7. $\delta(q2, b, B) = (q2, BB)$ 2. $\delta(q1, a, A) = (q1, AAA)$ 8. $\delta(q3, \varepsilon, Z0) = (q1, AZ0)$ 3. $\delta(q2, a, B) = (q3, \varepsilon)$ 9. $\delta(q0, \varepsilon, Z0) = (f, \varepsilon)$ 4. $\delta(q3, \varepsilon, B) = (q2, \varepsilon)$ 10. $\delta(q1, \varepsilon, Z0) = (q0, Z0)$ 5. $\delta(q0, b, Z0) = (q2, BZ0)$ 11. $\delta(q2, \varepsilon, Z0) = (q0, Z0)$ 6. $\delta(q1, b, A) = (q1, \varepsilon)$ 12. $\delta(q3, b, Z0) = (q2, BZ0)$ **Analyze** the execution of the given PDA and provide the sequence of Instantaneous Descriptions (IDs) to demonstrate that the strings **"bab"** and **"abb"** are accepted by L(P).	**[4]**	
Q2	**a)**	Consider the following CFG: E→ I / E+E / E*E / (E), I→ a / b / Ia / Ib / I0 / I1 **Analyze** the given CFG for the string **(b+a11)*(b0+a00)** by performing Leftmost **Derivation, Rightmost Derivation. Also, infer** whether the above-mentioned CFG is ambiguous or not for the above strings.	**[5]**	**CO3**
	b)	**Convert** the given regular expression $(a+b)^*bab^*$ into CFG Using the generated CFG, determine whether the following strings are accepted: **abbabb, and babbb**	**[5]**	
Q3		Consider the following grammar: **S → AX | B | ε** **A → aS | ε** **B → bA | C** **C → cB | ε** **X → aB | b** **Determine** the following steps: **i) Eliminate epsilon (ε)-productions** from the grammar. **ii) Remove unit productions** from the grammar. **iii) Eliminate useless symbols** from the grammar. iv) Convert the resulting grammar into **Chomsky Normal Form (CNF).**	**[10]**	**CO4**
Q4	**a)**	**Determine** that the language $L = \{0^{2n}1^{4n}, n>=1\}$ is not regular by using pumping lemma	**[5]**	**CO4**
	b)	**Design** a Turing Machine which recognizes the language $L=\{ a^nb^nc^n \mid n \geq 1\}$	**[5]**	

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Final Examination, Spring 2025

Course Code: CSE221, Course Title: Object Oriented Programming

Level:2 Term:2 Batch: ALL

Time: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	Explain the concept of ***Inheritance, Abstract Class, and Polymorphism*** in Java. How do they work together to create reusable and maintainable code?	5	CO1
	b)	**Scenario:** A company manages its employees using an **Employee Management System**. The system consists of: • **Base Class (Employee)** with attributes: name, ID, salary. • **Abstract Class (PermanentEmployee)** which extends Employee and has additional attributes: bonus. • **Concrete Class (ContractEmployee)** which extends Employee and has an attribute contractPeriod. • Implement **Polymorphism** by overriding a method calculateSalary() for both PermanentEmployee and ContractEmployee. **Task:** I. Implement the **Inheritance & Abstract Class** structure in Java. **(6)** II. Implement calculateSalary() method using polymorphism. **(2)** III. Demonstrate the use of **method overriding. (2)** *(Full correct implementation: 10 marks, Partial correctness: 6-8 marks, Minor issues: 3-4 marks)*	10	CO2
2.	*a)*	How does Java achieve multiple inheritance using Interfaces? I. Explain with an example how an interface can be used to achieve multiple inheritance in Java. **(3)** II. Discuss **advantages and limitations** of using interfaces for multiple inheritance. **(2)**	5	CO1

	b)	**Scenario:** **A Library System consists of:** • A Library that manages multiple Books. • Each Book has an Author and belongs to a Category. • Each Book is issued to a Member. **Task:** I. Design a **UML Class Diagram** covering **Inheritance, Abstract Class, Polymorphism, and Association** between Library, Book, Author, Category, and Member. **(6)** II. Clearly define relationships such as **One-to-Many, Many-to-Many. (2)** III. Justify the use of **Abstract Classes** and **Interfaces** if applicable. **(2)** *(Full correct implementation: 10 marks, Partial correctness: 6-8 marks, Minor issues: 3-4 marks)*	**10**	**CO3**
3.			**10**	**CO3**

Scenario:

A Ride-Sharing Application needs a system to manage:

- **Drivers** (Driver class)
- **Passengers** (Passenger class)
- **Rides** (Ride class)
- **Vehicles** (Vehicle class)

The system should:

- Allow a Passenger to book a Ride.
- Assign an available Driver to the ride.
- Ensure each Ride is associated with a Vehicle and a Driver.
- Implement calculateFare() as an **abstract method** that varies based on ride type (Economy, Premium).

Task:

a) **Design a UML Class Diagram** for the system. **(7)**
b) **Identify Associations** (One-to-Many, Many-to-Many). (3)

Good Luck