

Code: 20AM4703C, 20DS4703C

**IV B.Tech - I Semester – Regular / Supplementary Examinations  
DECEMBER 2025**

**HUMAN COMPUTER INTERACTION  
(Common for AIML, DS)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.

2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks
<b>UNIT-I</b>					
1	a)	Describe five important differences between Short Term Memory and Long-Term Memory.	L2	CO1	7 M
	b)	List the most common interface styles and note the different effects these have on the interaction.	L2	CO1	7 M
<b>OR</b>					
2	a)	Differentiate deductive reasoning, inductive reasoning and abductive reasoning.	L2	CO1	7 M
	b)	Use (in words as well as graphically) the interaction framework introduced in Human-Computer Interaction. Show how it can be used to explain problems in the dialog between a user and a computer.	L3	CO2	7 M

UNIT-II					
3	a)	List and describe the activities in the software life cycle.	L2	CO1	7 M
	b)	Explain the Eight Golden Rules of Interface Design.	L2	CO1	7 M
OR					
4	a)	Describe the Navigation design and its types.	L2	CO1	7 M
	b)	Apply the scenario-based interaction in an online shopping for Payment process.	L3	CO2	7 M
UNIT-III					
5		Analyze the implementation of MVC in a simple Bank App.	L3	CO4	14 M
OR					
6	a)	Apply input processing and output generation in a user interface.	L3	CO2	7 M
	b)	Classify events, UI objects, and event handlers. Illustrate how they interact in an event-driven program.	L3	CO4	7 M
UNIT-IV					
7	a)	Analyze the role of stakeholder analysis in capturing requirements. How do stakeholders influence system design?	L4	CO4	7 M
	b)	Explain what is meant by organizational issues in HCI.	L2	CO1	7 M
OR					

8	a)	Analyze why group working is considered more complex than individual behavior in Human-Computer Interaction.	L4	CO4	7 M
	b)	Analyze how face-to-face communication effect in the collaborative work of a model.	L4	CO4	7 M
UNIT-V					
9		Compare and contrast the benefits and challenges of multimodal interfaces compared to traditional WIMP interfaces.	L4	CO4	14 M
OR					
10	a)	Explain the importance of natural language understanding in the future of HCI.	L2	CO1	7 M
	b)	Compare and contrast augmented reality and mixed reality in terms of user experience and application areas.	L4	CO4	7 M

**PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY**  
**IV B.Tech. – I Sem- Regular Examinations December 2025**

**Human Computer Interaction**  
**SCHEME OF EVALUATION**  
**(Common for AIML, DS)**

**I. Short Scheme**

Q.No	Question	CO-Level	Total Marks	
1(a)	Describe five important differences between Short Term Memory and Long- Term Memory.	CO1-L2	7M	
	Any five differences between Short Term Memory and Long- Term Memory ➤ <b>Short-Term Memory</b> is limited, temporary, and used for immediate activities. ➤ <b>Long-Term Memory</b> is durable, vast, and used for storing life-long knowledge and experiences.			
1(b)	List the most common interface styles and note the different effects these have on the interaction.	CO1-L2	7M	
	<b>There are a number of common interface styles:</b> 1. Command line interface 2. Menus 3. Form-fills.			
2(a)	Differentiate deductive reasoning, inductive reasoning and abductive reasoning.	CO1-L2	7M	
	Any five differences between deductive, inductive and abductive ➤ <b>Deductive</b> → Logic-based, certain conclusions ➤ <b>Inductive</b> → Pattern-based, probable conclusions ➤ <b>Abductive</b> → Explanation-based, best guess.			
2(b)	Use (in words as well as graphically) the interaction framework introduced in Human-Computer Interaction. Show how it can be used to explain problems in the dialog between a user and a computer.	CO2-L3	7M	
	The framework consists of <b>four main components</b> and <b>four translations</b> Components :User, Input, System, Output Translations: Articulation, Performance, Presentation, Observation. diagram ---2M			
3(a)	List and describe the activities in the software life cycle.	7M	CO1-L2	7M
	The <b>software life cycle</b> consists of a sequence of activities carried out to develop, deliver, and maintain software. 1. <b>Requirements Specification</b> .2. <b>Architectural Design</b> .3. <b>Coding&amp; Unit Testing</b> ,4. <b>Integration&amp;Testing</b> ,5. <b>Maintenance</b> . diagram ---2M			
3(b)	Explain the Eight Golden Rules of Interface Design.	7M	CO1-L2	7M
	1. Strive for consistency 2.Enable frequent users to use shortcuts 3. Offer informative feedback 4. Design dialogs 5.Offer error prevention 6. Permit easy reversal 7. Support internal locus 8. Reduce short-term memory			
4(a)	Describe the Navigation design and it's types	7M	CO1-L2	7M
	Navigation design Refers to organizing an interface's navigation to enable users to seamlessly go from one point to another. two main types:1.Local structure 2.Global structure diagram ---2M			

4(b)	Apply the Scenario-based interaction in an online shopping for payment process	7M	CO2-L3	7M								
	Scenarios: rich stories of interaction, which can be used in conjunction with a method. Scenario-Based Interaction in Online Shopping (Payment Process): Scenario-based interaction breaks the payment process into user goals, actions, system responses, and error handling, making the interface easy, predictable, and user-friendly.											
5	Analyze the implementation of MVC in a simple Bank App.	14M	CO4-L4	14M								
	In a simple bank application, the Model-View-Controller (MVC) architecture separates the application into three distinct components to manage data, presentation, and user interaction effectively. Diagram --- 2M											
6(a)	Apply input processing and output generation in a user interface	7M	CO2-L3	7M								
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>Input</td> <td>User enters data</td> </tr> <tr> <td>Processing</td> <td>Validate &amp; compute</td> </tr> <tr> <td>Output</td> <td>Show results</td> </tr> </tbody> </table>	Step	Action	Input	User enters data	Processing	Validate & compute	Output	Show results			
Step	Action											
Input	User enters data											
Processing	Validate & compute											
Output	Show results											
6(b)	Classify events, UI objects and event handlers. Illustrate how they interact in an event-driven program.	7M	CO4-L4	7M								
	<ol style="list-style-type: none"> <li>1. <b>Events</b> are actions (click, key press, etc.).</li> <li>2. <b>UI Objects</b> are what users interact with (buttons, text fields, sliders).</li> <li>3. <b>Event Handlers</b> are the code that reacts to events.</li> <li>4. Together, they make programs <b>interactive</b> and <b>responsive</b>.</li> </ol>											
7(a)	Analyze the role of Stakeholder analysis in capturing requirements. How do stakeholders influence system design?	7M	CO4-L4	7M								
	<p><b>Role of Stakeholder Analysis:</b> Stakeholder analysis identifies all affected individuals or groups, captures and prioritizes their needs, resolves conflicts, and ensures the system meets critical requirements.</p> <p><b>Influence on System Design:</b> Stakeholders guide system design by defining requirements, setting priorities, influencing the interface, and establishing acceptance criteria to ensure the system meets real needs.</p>											
7(b)	Explain what us meant by organizational issues in HCI	7M	CO4- L4	7M								
	<p>Organizational issues:</p> <ol style="list-style-type: none"> <li>1. Cooperation or conflict</li> <li>2. Changing power structures</li> <li>3. Critical mass</li> <li>4. Evaluating the benefits</li> </ol>											
8(a)	Analyze why group working is considered more complex than individual behavior in Human-Computer Interaction	7M	CO4-L4	7M								
	individual behavior focuses on a single user's cognitive processes, while group working in HCI must address <b>cognitive, social, organizational, and technical interactions simultaneously</b> , making it significantly more complex.											
8(b)	Analyze how face-to-face communication effect in the collaborative work of a model	7M	CO4-L4	7M								
	face-to-face communication greatly enhances collaborative work by improving clarity, coordination, trust, and problem-solving, making group models more effective compared to purely computer-mediated collaboration.											
9	Compare and contrast the benefits and challenges of multimodal interfaces compared to traditional WIMP interfaces	14M	CO4-L4	14M								
	Multimodal interfaces and traditional WIMP (Windows, Icons, Menus, Pointer) interfaces differ in how users interact with systems. Multimodal interfaces offer more natural, flexible, and inclusive interaction but introduce higher complexity and technical challenges. WIMP interfaces remain reliable, precise, and cost-effective, making them suitable for many traditional desktop applications.											

	Any 5 points.			
10(a)	Explain the importance of Natural Language understanding in the future of HCI	7M	CO4-L4	7M
	Natural Language Understanding is a key driver of future HCI, shifting interaction from device-centered interfaces to <b>human-centered, intelligent, and conversational systems</b> that align with how people naturally communicate.			
10(b)	Compare and contrast augmented reality and mixed reality in terms of user experience and application areas	7M	CO4-L4	7M
	<b>AR</b> enhances the real world with digital layers and is suitable for everyday, lightweight applications. <b>MR</b> blends physical and digital worlds more deeply, enabling immersive, interactive experiences for complex, professional, and collaborative applications. Any 5 points full marks			



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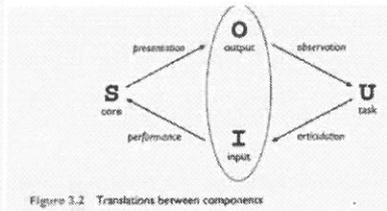
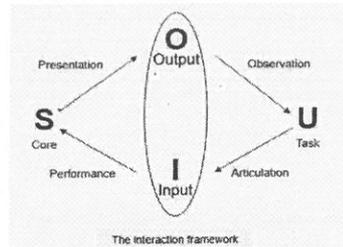
**Human Computer Interaction**  
**SCHEME OF EVALUATION**  
**(Common for AIML, DS)**

**II. Long Scheme**

Q.No	Question		CO-Level	Total Marks	
1(a)	Describe five important differences between Short Term Memory and Long- Term Memory.		CO1-L2	7M	
	Any five differences between Short Term Memory and Long- Term Memory.	7M			
	Aspect	Short-Term Memory (STM)	Long-Term Memory (LTM)		
	Duration	Holds information for a short time (about 15–30 seconds)	Holds information for a long time, from minutes to a lifetime		
	Capacity	Has a limited capacity (about 5–9 items)	Has a very large or unlimited capacity		
	Nature of Storage	Information is temporary	Information is relatively permanent		
	Type of Encoding	Mainly acoustic (sound-based)	Mainly semantic (meaning-based)		
	Rehearsal	Needs continuous rehearsal to retain information	Rehearsal helps in strengthening memory, not essential for storage		
	Forgetting	Forgetting occurs rapidly due to decay or interference	Forgetting occurs slowly, often due to retrieval failure		
	Organization	Poorly organized	Well organized and structured		
	Conscious Awareness	Always in conscious awareness	May or may not be in conscious awareness		
	Use in Learning	Used for immediate tasks and processing	Used for long-term learning and knowledge		
1(b)	List the most common interface styles and note the different effects these have on the interaction.		CO1-L2	7M	
	Interface Style	Description			Effect on Interaction
	Command Line Interface (CLI)	Users type text commands to interact with the system			<ul style="list-style-type: none"> <li>• Fast for expert users</li> <li>• Requires memorization of commands</li> <li>• High error rate for beginners</li> </ul>
	Menu-Driven Interface	Users choose options from displayed menus			<ul style="list-style-type: none"> <li>• Easy to learn</li> <li>• Reduces memory load</li> <li>• Slower for experienced users</li> </ul>
	Form-Based Interface	Users enter data into predefined fields			<ul style="list-style-type: none"> <li>• Structured data entry</li> <li>• Reduces input errors</li> <li>• Can feel rigid or time-consuming</li> </ul>
	Graphical User	Uses windows, icons,	• Intuitive and visually appealing		

	Interface (GUI)	menus, and pointers	<ul style="list-style-type: none"> <li>• Supports direct manipulation</li> <li>• Requires more system resources</li> </ul>	
	Direct Manipulation Interface	Users interact directly with objects (drag, drop, resize)	<ul style="list-style-type: none"> <li>• Immediate feedback</li> <li>• Easy to understand</li> <li>• Increases user engagement</li> </ul>	
	Natural Language Interface	Users interact using spoken or written natural language	<ul style="list-style-type: none"> <li>• Easy for beginners</li> <li>• Can be ambiguous</li> <li>• Depends on system accuracy</li> </ul>	
	Touch-Based Interface	Interaction through touch gestures	<ul style="list-style-type: none"> <li>• Fast and natural interaction</li> <li>• Limited precision for small targets</li> <li>• Good for mobile devices</li> </ul>	
2(a)	Differentiate deductive reasoning, inductive reasoning and abductive reasoning.		CO1-L2	7M
	Any five differences between deductive, inductive and abductive		7M	
	Aspect	Deductive Reasoning	Inductive Reasoning	Abductive Reasoning
	Definition	Reasoning from general rules to specific conclusions	Reasoning from specific observations to general rules	Reasoning from observations to the most likely explanation
	Direction of Reasoning	General → Specific	Specific → General	Observation → Best possible explanation
	Certainty of Conclusion	Conclusion is certain if premises are true	Conclusion is probable, not guaranteed	Conclusion is plausible, not certain
	Basis	Based on logic and rules	Based on patterns and evidence	Based on inference and hypothesis
	Risk of Error	Very low (if premises are correct)	Possible due to limited observations	Higher, as multiple explanations may exist
	Use in Problem Solving	Used to apply known theories or laws	Used to form theories or generalizations	Used to diagnose or explain situations
	Example	All humans are mortal. Socrates is a human. ∴ Socrates is mortal.	The sun has risen every day so far. ∴ The sun will rise tomorrow.	The ground is wet. ∴ It probably rained last night.
Common Fields of Use	Mathematics, formal logic	Science, research, data analysis	Medicine, troubleshooting, AI, HCI	
2(b)	Use (in words as well as graphically) the interaction framework introduced in Human-Computer Interaction. Show how it can be used to explain problems in the dialog between a user and a computer.		CO2-L3	7M
	<p><b>Interaction Framework:</b>  The framework consists of four main components and four translations:</p> <p><b>Components</b>  User – Has goals and intentions.  Input – Mechanisms for entering information (keyboard, mouse, touch, voice).</p>			

System – The core computer system that processes input.  
 Output – Mechanisms for presenting results (screen, sound, vibration).

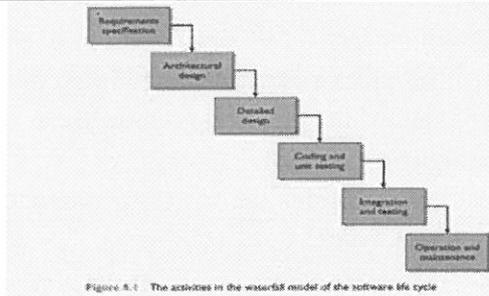


**Translations (Interaction Cycle)**

Articulation – User expresses intentions as actions.  
 Performance – Input devices convert actions into system-understandable form.  
 Presentation – System presents results via output.  
 Observation – User interprets system output.

List and describe the activities in the software life cycle.	7M	CO1-L2	7M
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3(a)



**1.Requirements Specification** :Identifies and documents what the software should do based on user needs. This phase focuses on **understanding user needs** and clearly defining what the software must do. All functional and non-functional requirements are collected, analyzed, and documented. This helps avoid confusion, reduces future changes, and acts as a reference throughout development.

**2.Architectural Design:** Defines the overall structure of the system, including components and their interactions. In this phase, the **overall structure of the system** is planned. The system is divided into components or modules, and their interactions are defined. Decisions about technologies, databases, and system architecture are made to ensure scalability, performance, and reliability.

**3.Coding & Unit Testing:** Developers write the code and test individual modules to ensure they work correctly. Developers **write the actual program code** according to the design specifications. Each module is then tested individually (unit testing) to check correctness, logic errors, and proper functioning before integration with other modules.

**4.Integration & Testing:** Combines all modules and tests the complete system to find errors and verify functionality. All individual modules are **combined into a complete system**. The integrated software is tested to detect interface issues, system errors, and performance problems. This phase ensures the software works as expected and meets the specified requirements before deployment.

**5.Maintenance:**Updates and fixes the software after delivery to correct bugs and improve performance.

Explain the Eight Golden Rules of Interface Design.	7M	CO1-L2	7M
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3(b)

Shneiderman’s **8 Golden Rules** based on your image:  
**1.Strive for consistency** in action sequences, layout, terminology, command use and so on.  
**2.Enable frequent users to use shortcuts**, such as abbreviations, special key sequences

and macros, to perform regular, familiar actions more quickly.

3. Offer **informative feedback** for every user action, at a level appropriate to the magnitude of the action.
4. **Design dialogs** to yield closure so that the user knows when they have completed a task.
5. Offer **error prevention** and simple error handling so that, ideally, users are prevented from making mistakes and, if they do, they are offered clear and informative instructions to enable them to recover.
6. **Permit easy reversal** of actions in order to relieve anxiety and encourage exploration, since the user knows that he can always return to the previous state.
7. **Support internal locus** of control so that the user is in control of the system, which responds to his actions.
8. **Reduce short-term memory** load by keeping displays simple, consolidating multiple page displays and providing time for learning action sequences.

	7M	CO1-L2	7M
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4(a)

**Navigation design**

Refers to organizing an interface's navigation to enable users to seamlessly go from one point to another. It provides users with knowledge of where they are in the interface, how they reached there, and where they can go from there.

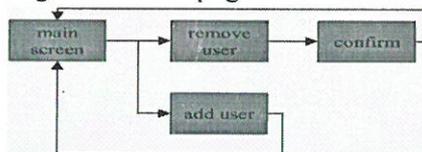
**Structure of navigation design**

The UI designer must consider the interface's structure to organize the navigation. The structure is of two main types:

1. Local structure
2. Global structure

**Local structure**

**Local structure** refers to a single screen or page in an interface.

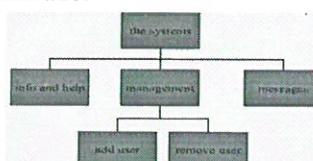


**Global structure**

**Global structure** refers to how all the screens in an interface link together. There are two ways to organize the global structure:

**Hierarchical organization:**

The whole system is functionally decomposed into logical groups. This hierarchy helps define the menu options of an interface.



	7M	CO2-L3	7M
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4(b)

Apply the Scenario-based interaction in an online shopping for payment process

**Scenarios:** rich stories of interaction, which can be used in conjunction with a method.

Scenario-Based Interaction in Online Shopping (Payment Process)

Scenario: Paying for an online order

User: A customer who has selected products in the cart.

Goal: Complete payment successfully for the items purchased.

Context: Using a website or mobile app.

Step 1: User Intention (Goal):The user wants to pay for the selected items.The system should support multiple payment options (credit card, debit card, UPI, wallet).

Step 2: User Action:Click on “Proceed to Checkout”.Select Payment Method (e.g., Credit Card, UPI, Wallet).Enter required details (card number, CVV, expiry, or UPI PIN).Click “Pay Now”.

Step 3: System Response (Feedback):System validates payment details.Shows loading or processing indicator.

On success: displays confirmation message (“Payment Successful, Order Placed”).

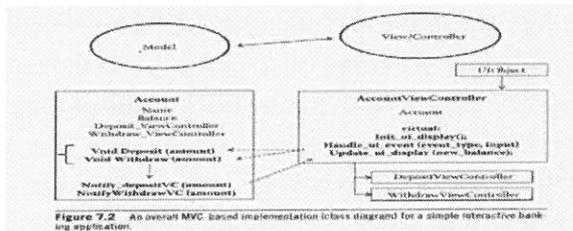
On failure: displays error message with guidance (“Incorrect CVV, try again”).

Step 4: User Observation:User checks confirmation to ensure payment is successful. User may download receipt or order summary.

Step 5: Iteration / Error Handling:If payment fails, user can retry or choose another payment method.System provides clear recovery options.

5	Analyze the implementation of MVC in a simple Bank App.	14M	CO4-L4	14M
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In a simple bank application, the Model-View-Controller (MVC) architecture separates the application into three distinct components to manage data, presentation, and user interaction effectively.



**Example of MVC Implementation 1: Simple Bank Application:**

- The **Model** is the *BankAccount*. It represents the data of the application, such as the account balance. It also contains the logic for banking operations like deposit and withdrawal.
- The **View** is the *BankView*. Its job is only to display information to the user. For example, it can show the current balance or print a message like “Deposit successful” or “Insufficient balance.”
- The **Controller** is the *BankController*. It acts like a bridge between the Model and the View. When the user requests an action (like deposit or withdraw), the controller tells the model to perform that action.
- Finally, in the **main program**, we create objects of the Model, View, and Controller. The controller manages the operations, the model updates the balance, and the view shows the messages.

6(a)	Apply input processing and output generation in a user interface	7M	CO2-L3	7M
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**Input Processing:** Input processing is the way a user interface takes data from the user, checks it for correctness, and converts it into a form the system can understand. For example, when a user enters the quantity of an item in a shopping app, the system validates that it is a positive number before using it in calculations.

**Output Generation:**Output generation is how the system presents processed information back to the user in an understandable format. For instance, after calculating the total price in a shopping cart, the UI displays the result clearly so the user can see and act on it.

	Classify events,UI objects and event handlers. Illustrate how			
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6(b)	they interact in an event-driven program.	7M	CO4-L4	7M
<p><b>Events, UI Objects, and Event Handlers:</b></p> <p><b>1. Events:</b>Events are actions or occurrences that happen during the interaction between a user and a system. They are triggered by the user or the system and notify the application that something has occurred. Examples of Events:Mouse click,Key press,Touch gesture</p> <p><b>2. UI Objects (User Interface Objects):</b>UI Objects are the graphical elements or components of a user interface that users interact with.</p> <p>1. Common UI Objects:1.Buttons 2.Text fields 3.Checkboxes 4.Sliders 5.Menus</p> <p><b>3. Event Handlers:</b>Event Handlers are functions or procedures written in the code that define how the system should respond when a specific event occurs on a UI object.</p>				
7(a)	Analyze the role of Stakeholder analysis in capturing requirements. How do stakeholders influence system design?	7M	CO4-L4	7M
<p><b>Role of Stakeholder Analysis in Capturing Requirements:</b></p> <p><b>Stakeholder analysis</b> is the process of identifying all individuals or groups who have an interest in or are affected by a system, and understanding their needs, expectations, and influence. It plays a <b>crucial role in capturing requirements</b> because:</p> <p><b>Identifies Requirements Sources:</b> Different stakeholders—users, managers, clients, regulatory bodies—have different needs. Stakeholder analysis ensures no critical requirement is overlooked.</p> <p><b>Prioritizes Needs:</b> Some stakeholders’ needs are more critical to the system’s success. Analysis helps prioritize features and functionalities.</p> <p><b>Clarifies Conflicts:</b> Conflicting requirements between stakeholders can be identified early, allowing negotiation or compromise.</p> <p><b>Ensures Acceptance:</b> Involving stakeholders in requirement gathering increases the likelihood that the final system meets their expectations and gains approval.</p> <p><b>How Stakeholders Influence System Design</b></p> <p>Stakeholders directly shape <b>how the system is designed</b> because their requirements define:</p> <p><b>Functional Requirements:</b> What the system must do (e.g., a user wants a quick search feature).</p> <p><b>Non-Functional Requirements:</b> Performance, usability, security, and compliance (e.g., managers may demand faster response time, while legal teams ensure data privacy).</p> <p><b>Interface Design:</b> Stakeholders guide how intuitive and user-friendly the UI should be.</p> <p><b>Prioritization of Features:</b> Stakeholders determine which features are essential versus optional, affecting the development roadmap.</p> <p><b>Acceptance Criteria:</b> Stakeholders’ expectations influence testing, validation, and system deployment decisions.</p>				
7(b)	Explain what us meant by organizational issues in HCI	7M	CO4- L4	7M
<p>There are several organizational issues that affect the acceptance of technology by users and that must therefore be considered in system design:</p> <ul style="list-style-type: none"> <li>• Systems may not take into account conflict and power relationships</li> <li>• Those who benefit may not do the work</li> <li>• Not everyone may use systems</li> </ul>				

In addition to generic issues, designers must identify specific stakeholder requirements within their organizational context.

Socio-technical models capture both human and technical requirements.

**Cooperation or conflict:** This issue relates to the dynamics of how individuals and groups interact within the organization.

**Cooperation** (functional) is essential for aligning efforts toward common goals, efficient workflow, and overall teamwork.

**Conflict** (dysfunctional) can stem from differences in opinion, priorities, power struggles, or role ambiguity, which can hinder performance and create tension. A key management challenge is to foster functional cooperation while managing dysfunctional conflict effectively.

**Changing power structures:** This issue involves the shifts in the distribution of authority, influence, and decision-making power within an organization.

Power structures can change due to growth, new technology, external environmental pressures, or a redesign of the organizational chart (e.g., shifting from a hierarchical to a team-based structure).

These changes can lead to uncertainty and resistance among employees, but are often necessary for an organization to remain adaptive and responsive to its environment.

**Critical mass:** In an organizational context, "critical mass" can refer to a few different concepts, often related to the point at which a movement, idea, or change becomes self-sustaining and widespread. It can also refer to the minimum number of people, resources, or support needed to achieve a specific goal or initiate a major transformation successfully.

Achieving critical mass is a challenge when trying to implement large-scale change, as initial resistance or lack of participation can stall progress.

**Evaluating the benefits:** This is the process of assessing whether the current organizational strategies, structures, or changes are yielding positive results, such as increased efficiency, profitability, employee satisfaction, or goal attainment.

Evaluation involves setting clear objectives and measuring outcomes to determine the true value of organizational choices. This can be challenging as some benefits (e.g., enhanced morale) can be harder to quantify than others (e.g., increased sales).

8(a)	Analyze why group working is considered more complex than individual behavior in Human-Computer Interaction	7M	CO4-L4	7M
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individual behavior focuses on a single user's cognitive processes, while group working in HCI must address **cognitive, social, organizational, and technical interactions simultaneously**, making it significantly more complex.

Group working is considered more complex than individual behavior in **Human-Computer Interaction (HCI)** because it involves not just interaction between a user and a system, but also **interactions among multiple users mediated by the system**. Key reasons include:

1. **Multiple Users, Multiple Goals:** Individuals in a group may have different roles, objectives, priorities, and levels of expertise, making it harder to design interfaces that satisfy everyone.
2. **Coordination and Communication Needs:** Group work requires coordination, turn-taking, shared awareness, and communication. Systems must support collaboration, messaging, and synchronization, which adds complexity beyond single-user interaction.
3. **Social and Organizational Factors:** Group behavior is influenced by social norms, power structures, hierarchy, trust, and cultural differences, all of which affect how users interact with the system and each other.
4. **Shared Context and Awareness:** In group settings, users need awareness of others' actions (who is doing what, when, and why). Designing for shared workspaces and real-time updates is challenging.
5. **Conflict and Decision-Making:** Groups may face conflicts, disagreements, or negotiation during tasks. Interfaces must support discussion, consensus building, and conflict resolution.
6. **Time and Space Distribution:** Group work can be synchronous or asynchronous, co-located or distributed. Supporting all these modes increases system and interaction complexity.
7. **System Consistency and Data Integrity:** Multiple users accessing and modifying shared data raises issues like version control, concurrency, and error handling.

8(b)	Analyze how face-to-face communication effect in the collaborative work of a model	7M	CO4-L4	7M
<p>Face-to-face communication has a strong impact on collaborative work because it enhances both <b>human interaction quality</b> and <b>task coordination</b> within a group model. Its effects can be analyzed as follows:</p> <p><b>Rich Communication Cues</b> Face-to-face interaction provides verbal and non-verbal cues such as facial expressions, gestures, tone of voice, and eye contact. These cues reduce ambiguity and help collaborators interpret meaning accurately.</p> <p><b>Improved Coordination and Awareness</b> Team members can immediately see who is speaking, working, or facing difficulty. This shared awareness supports smoother turn-taking, task allocation, and real-time coordination.</p> <p><b>Faster Feedback and Problem Solving</b> Immediate responses allow quick clarification of doubts and rapid resolution of misunderstandings, improving decision-making and task efficiency.</p> <p><b>Stronger Trust and Social Bonding</b></p>				

	<p>Personal interaction builds trust, empathy, and group cohesion. This social bonding improves cooperation and willingness to share ideas.</p> <p><b>Effective Conflict Resolution</b> Disagreements can be addressed more easily through discussion and observation of emotional reactions, reducing escalation and misunderstandings.</p> <p><b>Shared Context and Understanding</b> Collaborators can easily reference physical artifacts (documents, sketches, screens), leading to a common understanding of the task and goals.</p> <p><b>Limitations</b> Face-to-face communication requires co-location and scheduling, making it less flexible for distributed teams. Dominant personalities may also overshadow quieter members.</p>			
9	<p>Compare and contrast the benefits and challenges of multimodal interfaces compared to traditional WIMP interfaces</p>	14M	CO4-L4	14M
	<p>Multimodal interfaces and traditional WIMP (Windows, Icons, Menus, Pointer) interfaces differ in how users interact with systems.</p> <p><b>Multimodal Interfaces:</b><i>(Use multiple input/output modes such as speech, touch, gesture, eye gaze, haptics)</i></p> <p><b>Benefits</b></p> <p><b>Natural interaction:</b> Matches human communication styles (talking, pointing, gesturing).</p> <p><b>Improved accessibility:</b> Supports users with disabilities (e.g., voice input for motor-impaired users).</p> <p><b>Flexibility:</b> Users can choose the most convenient modality based on context.</p> <p><b>Efficiency:</b> Parallel use of modalities (e.g., speaking while pointing) speeds up tasks.</p> <p><b>Robustness:</b> If one modality fails, others can compensate.</p> <p><b>Challenges</b></p> <p><b>Design complexity:</b> Integrating and coordinating multiple modalities is difficult.</p> <p><b>Recognition errors:</b> Speech and gesture recognition can be inaccurate.</p> <p><b>Learning curve:</b> Users may be unsure which modality to use and when.</p> <p><b>Context sensitivity:</b> Performance varies with noise, lighting, or environment.</p> <p><b>Higher cost:</b> Requires advanced hardware and processing.</p> <p><b>Traditional WIMP Interfaces:</b><i>(Use mouse, keyboard, menus, icons in a graphical environment)</i></p> <p><b>Benefits</b></p> <p><b>Consistency and predictability:</b> Standardized interaction style.</p> <p><b>High precision:</b> Accurate control for tasks like editing and design.</p> <p><b>Low error rates:</b> Mature and well-tested technologies.</p> <p><b>Easy to learn:</b> Familiar to most users.</p> <p><b>Cost-effective:</b> Works with basic hardware.</p> <p><b>Challenges</b></p> <p><b>Less natural:</b> Not aligned with human communication methods.</p> <p><b>Limited accessibility:</b> Difficult for users with motor or visual impairments.</p> <p><b>Sequential interaction:</b> Slower for complex or multitasking activities.</p> <p><b>Not context-aware:</b> Same interaction regardless of environment.</p>			
10(a)	<p>Explain the importance of Natural Language understanding in the future of HCI</p>	7M	CO1-L2	7M

	<p><b>Natural Language Understanding (NLU)</b> is crucial to the future of <b>Human-Computer Interaction (HCI)</b> because it enables computers to understand, interpret, and respond to human language in a meaningful way. Its importance can be explained as follows:</p> <p><b>More Natural Interaction:</b> NLU allows users to interact with systems using everyday language instead of rigid commands, making technology more intuitive and user-friendly.</p> <p><b>Improved Accessibility and Inclusion:</b> Voice- and text-based natural language interaction benefits users with disabilities, low literacy, or limited technical skills, promoting inclusive design.</p> <p><b>Reduced Learning Effort:</b> Users do not need to learn complex interfaces or commands; systems can understand intent directly from natural language input.</p> <p><b>Context-Aware and Intelligent Systems:</b> NLU helps systems understand context, user intent, emotions, and ambiguity, enabling personalized and adaptive interactions.</p> <p><b>Support for Multimodal Interaction:</b> NLU works alongside gestures, touch, and visual inputs to create rich multimodal interfaces, improving efficiency and flexibility.</p> <p><b>Enhanced Conversational Interfaces:</b> Virtual assistants, chatbots, and conversational agents rely on NLU to hold meaningful, goal-oriented conversations.</p> <p><b>Improved Collaboration and Productivity:</b> In collaborative systems, NLU enables intelligent support such as automatic meeting summaries, task tracking, and smart recommendations.</p> <p><b>Scalability Across Domains:</b> NLU-powered interfaces can be applied to healthcare, education, smart homes, vehicles, and enterprise systems.</p>			
10(b)	Compare and contrast augmented reality and mixed reality in terms of user experience and application areas	7M	CO4-L4	7M
	<p><b>Augmented Reality (AR) vs. Mixed Reality (MR): User Experience and Application Areas</b></p> <p>Augmented Reality (AR) and Mixed Reality (MR) both blend digital content with the real world, but they differ in how deeply virtual elements interact with the physical environment.</p> <p><b>1. User Experience</b></p> <p><b>Augmented Reality (AR)</b></p> <p>Overlays digital information (text, images, 3D objects) onto the real world.</p> <p>Virtual content does not fully interact with physical objects.</p> <p>Limited environmental awareness.</p> <p>Interaction is usually simple (touch, tap, basic gestures).</p> <p>Experience feels like enhanced reality, not altered reality.</p> <p>Example UX: Pokémon appearing on a phone screen, labels on real-world objects.</p> <p><b>Mixed Reality (MR)</b></p> <p>Virtual objects are anchored to and interact with the physical environment.</p> <p>System understands space, depth, surfaces, and objects.</p> <p>Users can manipulate virtual objects using gestures, gaze, or voice.</p> <p>Experience feels immersive and responsive.</p> <p>Example UX: A virtual model placed on a real table that users can walk around and modify.</p> <p><b>2. Application Areas</b></p> <p><b>Augmented Reality (AR)</b></p> <p>Education: Interactive textbooks, learning overlays.</p> <p>Retail: Virtual try-ons, product previews.</p>			

Navigation & tourism: Directional overlays, landmarks.  
 Marketing & entertainment: Games, ads, filters.  
 Maintenance & repair: Simple visual instructions.  
 Mixed Reality (MR)  
 Industrial training: Simulated equipment handling.  
 Healthcare: Surgical planning, anatomy visualization.  
 Architecture & design: Real-scale 3D models in physical spaces.  
 Collaborative work: Shared virtual workspaces.  
 Advanced simulation: Defense, robotics, manufacturing.

### 3. Key Differences Summary

Aspect	Augmented Reality (AR)	Mixed Reality (MR)
Interaction with real world	Overlay only	Deep interaction
Environmental awareness	Low	High
Immersion	Moderate	High
Hardware	Smartphones, tablets, basic AR glasses	Advanced headsets (e.g., HoloLens)
Complexity	Lower	Higher
Cost	Lower	Higher

