ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION
SUMMER SEMESTER, 2022-2023

DURATION: 3 HOURS
FULL MARKS: 150

CSE 4885: Human Computer Interaction

Programmable calculators not allowed. Do not write anything on the question paper.
Answer all 6 (six) questions. Figures in the right margin indicate full marks of questions with
corresponding COs and POs in parentheses.

1. **Case Study A:** You are tasked with designing an AI-driven chat application for personalized mental health support, tailored to users communicating in Bangla. This application utilizes machine learning algorithms to analyze user text messages, generating a depression score reflective of the user's mental health condition. Additionally, the chatbot provides personalized well-being plans based on individual preferences and adaptive strategies, integrating advanced Natural Language Processing (NLP) and Machine Learning (ML) technologies. The project aims to contribute to the intersection of Human-Computer Interaction (HCI), ML, and mental health, prioritizing technical efficacy and user satisfaction. Evaluation involves quantitative metrics such as emotion recognition accuracy and qualitative user experience feedback.

    a) How is the Interaction Design process related to this scenario? Write five usability goals and five user experience goals of Interaction Design that you think are most relevant. Provide justification in one-sentence behind choosing these goals. | 15 (CO3) (PO2)

    b) Explain why and how you would perform trade-off analysis between these goals. | 10 (CO3) (PO2)

2. a) Explain the relationships among conceptual models, metaphors, and mental models with examples. | 8 (CO3) (PO1)

    b) Suppose you have an idea for a system for the problem described in **Case Study A**. The mental health chatbot should run on any device in real time. Now you need to communicate the design idea to your teammates. You have chosen the tool 'Conceptual model' for this based on:
    - Entities: The people, places, and things.
    - Relationships: How the entities interact with one another.
    - Constraints: The number of entities interacting.

    Find out the most appropriate conceptual model(s) based on activities for the scenario with justifications. | 12 (CO3) (PO2)

    c) Explain how the Star lifecycle model differs from the Usability Engineering lifecycle model as the process of interaction design. | 5 (CO3) (PO1)

3. a) What are the key principles of User-Centered Design (UCD), and how can they be applied in the design process of the mental health monitoring chat application described in **Case Study A** of Question 1? Write your answer concerning the inclusion of users at different phases of UCD. | 13 (CO4) (PO2)

    b) Briefly mention how you would generate alternate design solutions for the scenario described in Case Study A and the basis on which you will choose among the alternatives. | 12 (CO4) (PO2)

4. a) Construct suitable prototype(s) for the system using appropriate prototyping technique(s) for the scenario in **Case Study A** of Question 1. Mention the name of the prototype construction technique.
    9 (CO5) (PO3)

    b) Suppose a fashion house wants to improve the overall experience of their customers visiting and purchasing through their online page. As a UX designer, you are asked to create an experience map (wheel representation) based on customer feedback. Explain the stages of creating an experience map through a wheel representation based on the following customer feedback points:
    10 (CO5) (PO2)
    - Difficulties in finding the desired product
    - Confusion regarding the size and fit
    - Easy product ordering process
    - Prompt delivery and shipment tracking facility
    - After-sales service

    c) What is the relationship between ethnography and affinity-diagramming process? Explain.
    6 (CO4) (PO1)

5. a) In the context of designing an AI-driven chat application for personalized mental health support in Bangla as described in **Case Study A** of Question 1, identify the independent variables that you would test, and explain any potential confounding variables. Justify your choices based on the scenario provided.
    9 (CO5) (PO2)

    b) Describe the methodology you would employ to conduct both between-subjects and within-subject experiments to evaluate the effectiveness and usability of the AI-driven chat application for personalized mental health support. Provide detailed explanations of the procedures and considerations involved in each type of experiment.
    10 (CO5) (PO1)

    c) Do you need any ethical approval to conduct the research experiment? Explain your answer with examples if applicable.
    6 (CO5) (PO1)

6. **Case Study B:** Children with Down Syndrome (DS) may suffer from an intellectual disability as well as physical and social disability. Physical disability falls into two categories: fine motor skills (e.g., picking, grasping, holding small objects — that use the small muscles of the fingers, toes, wrists, lips, and tongue) and gross motor skills (e.g., walking, kicking, jumping, and climbing stairs — that use the large muscles in the arms, legs, torso, and feet) deficiency.

    Research shows that Game Therapy has a positive effect on improving the motor skills of children with DS. Suppose you have to conduct research and design a game therapy system for children with DS to improve gross motor skills.

    a) Describe how are you going to identify the list of requirements for the system. Which data-gathering technique(s) will you follow? Explain with examples.
    15 (CO4) (PO2)

    b) How will you represent those requirements to your teammates for better analysis? Explain the requirement representation technique using one example and one requirement analysis method.
    10 (CO4) (PO2)