ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **SUMMER SEMESTER, 2021-2022**

DURATION: 1 HOUR 30 MINUTES **FULL MARKS: 75**

CSE 4849: Human Computer Interaction

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer **all 3 (three)** questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

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1. a) Explain how the Cognitive Computational Model, MHP can be used to compute the followings: 10 (CO2) (PO1)
   i. A user sits before a computer display terminal. Whenever any symbol appears, s/he is to press the space bar. What is the time between the stimulus and the response?
   ii. The user is presented with two symbols, one at a time. If the second symbol is identical to the first, the user is to push the key labeled 'YES', otherwise the user is to push 'NO'. What is the time between the stimulus and the response for the 'YES' case?

   b) According to KFF Health tracking poll from July 2020, many subjects reported negative impacts on their mental health and well-being over the ongoing period of COVID-19. They reported difficulties in sleeping, eating, stress related to isolation and job loss, symptoms of anxiety, depressions, suicidal attempts and so on. 15 (CO1) (PO1)
   Briefly discuss on the types of HCI applications and data domains including different technologies required to address the Mental Health issues for this scenario.

2. a) Cues related to human depth perception can be utilized for visual scene understanding in various real-life applications. Explain with example how depth cues could be effectively utilized in solving computer vision-based sign language recognition problem. 15 (CO2) (PO2)

   b) Define Fitts' Law and how it applies to user interface design. Apply your knowledge of this law to Figure 1 below and identify which target you think is the fastest to reach with the mouse starting at location *M*. Provide a brief reasoning for your choice. Assume that you can move your hand equally well in all directions, and that none of the targets are near a screen edge. Show the necessary calculations in your answer. 10 (CO2) (PO2)

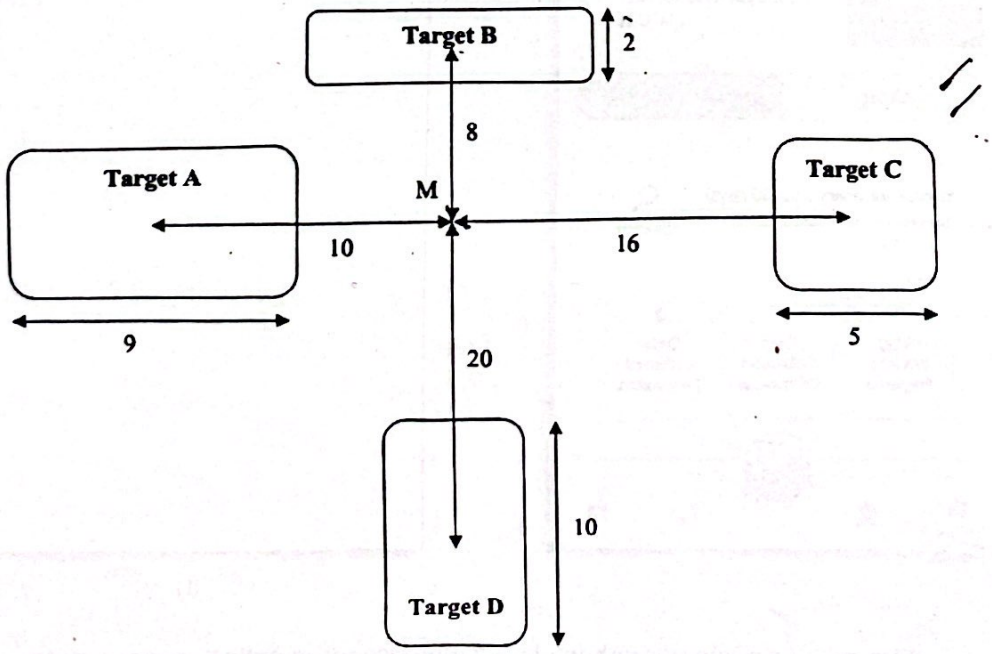

Figure 1: Design implication of Fitts' law

3. a) Consider the searching task in smartphone-based interfaces of an online courier service as shown in Figure 2 (a-d).

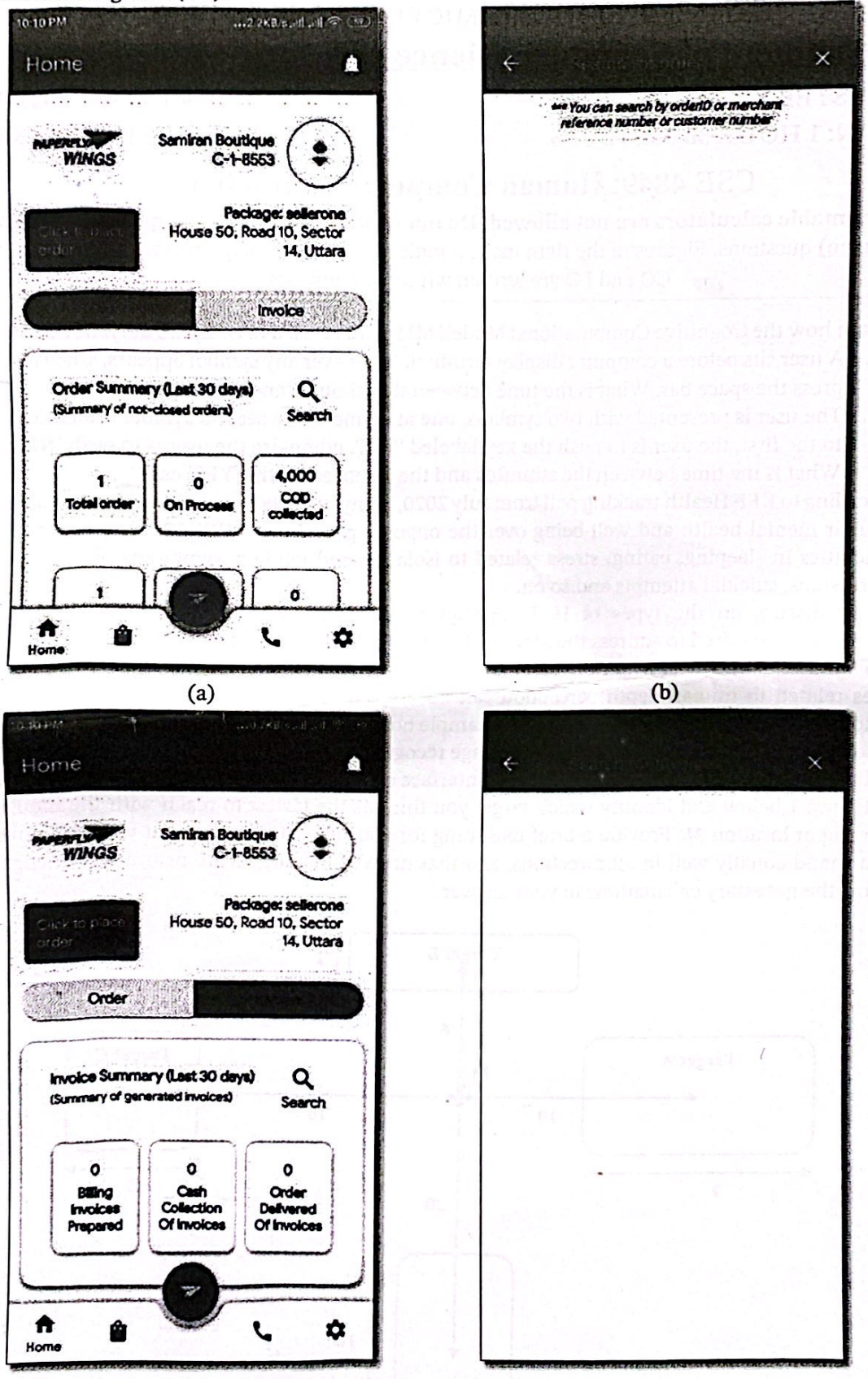

Figure 2: Example smartphone-based interfaces of an online courier service

You are given a choice to select two interaction styles for the task. One is writing a query string in the search box and another one is giving voice commands using natural language. You are asked to use the interaction model to analyze interaction problems involved in the task. Answer the followings:

i. Describe different gulfs with examples in each stage of the interactions for these two styles of interaction and justify which interaction style will give a better user experience. 6 (CO3) (PO1)

ii. How can you assess the mappings of different translation languages through the interaction model for the searching task through the interfaces of Figure 2 (a-d)? Explain your answer. 6 (CO3) (PO2)

iii. Identify the tasks related to memory recall and recognition and list at least three problems related to concept of information retrieval in the search interfaces of Figure 2 (a-d) 5 (CO3) (PO2)

b) Visibility, feedback, constrains, consistency, affordance are the design principles used by interaction designers to aid their thinking when designing for the user experiences. Give one example of each of the design principles mentioned with their design implications. 8 (CO3) (PO2)

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Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION **SUMMER SEMESTER, 2021-2022**

DURATION: 3 HOURS **FULL MARKS: 150**

CSE 4849: Human Computer Interaction

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Answer **all 6 (six)** questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

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1. Google Maps is one of the top most apps used for online navigating. Google Maps designs its affordances for the users to interact with a certain, perhaps playful, attitude. Google Timeline, Google Local Guides, and Google Earth thus contain affordances that allow for a certain interaction, in order to be used for different purposes. Google Timeline could be seen as a take-over of an analogue diary, Google Local Guides serves as a social network, and Google Earth shows similarities to a travel guide.

   a) How are the interface metaphors and conceptual models related to each other for conceptualizing interactions? — 7 (CO1) (PO1)

   b) Identify and explain the interface metaphors used in various Google applications mentioned in the scenario and discuss how they create a conceptual model that is based on familiar real-world objects or concepts. — 9 (CO3) (PO2)

   c) Find out and explain the types of interaction to support the conceptual models you have identified in the scenario. — 9 (CO3) (PO2)

2. Suppose you need to design a chat application to help users monitor their mental health by analyzing their text messages in Bangla. The application utilizes machine learning algorithms to analyze the messages and returns a depression score based on the severity of the user's mental health condition. The scoring system has been developed based on extensive research and data analysis, ensuring that it provides accurate and reliable results. Users can also receive personalized recommendations for mental health resources and treatment options based on their scores.

   To ensure that the application is user-friendly, the design team has to conduct extensive user research to understand the needs and preferences of the target audience. The team also needs to conduct usability tests and gather feedback from beta users to refine the design and ensure that it meets the requirements of the users.

   Overall, the chat application aims to provide a user-friendly and effective tool for users to monitor their mental health and seek appropriate treatment and resources.

   Based on the scenario, answer the followings:

   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 the given scenario? — 13 (CO4) (PO2)

   b) Briefly describe how you will generate alternate design solutions for the scenario and on which basis you will choose among the alternatives. — 12 (CO4) (PO1)

3. **Case Study A:**
Children with Down Syndrome (DS) may suffer from an intellectual as well as physical and social disability. Physical disability falls into two categories, fine motor skill (e.g. picking, grasping, holding small objects - that use the small muscles of the fingers, toes, wrists, lips, and tongue) and gross motor skill (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 the children with DS to improve gross motor skills.

a) Describe how you are going to identify the list of requirements of the system. Which data gathering technique will you follow? Give example. — 8 (CO4) (PO2)

b) Write at least two measurable usability requirements for each of the following usability goals: — 10 (CO4) (PO1)
   i. Having good utility
   ii. Effectiveness
   iii. Efficiency

c) How will you represent those requirements to your teammates for analysis? Give example. — 7 (CO4) (PO3)

4. a) Which prototyping technique will you follow for the system as described in the **Case Study A** in Question 3? Explain why. — 8 (CO5) (PO2)

b) Construct a prototype for the system using an appropriate prototyping technique for the scenario in **Case Study A**. — 10 (CO5) (PO3)

c) Write one main persona and corresponding scenario capturing how the user is expected to interact with the system as described in **Case Study A**. — 7 (CO5) (PO2)

5. Suppose a social media-based fashion house is looking to improve its online presence and increase customer engagement. The fashion house has large followers on the social media page but is struggling to convert likes and engagements into actual online sales. They have decided to collect data on their social media platforms, including engagement rates, traffic sources, types of posts, and customer feedback. However, the data is unorganized and difficult to make sense of, making it challenging for the fashion house to identify key areas for improvement. For this scenario answer the followings:

a) Explain how you as a consultant would use the affinity diagramming process to help the fashion house organize the data and identify key areas for improvement. Be sure to include a step-by-step description of the process, including how you would group related data, identify common themes, and refine the groupings. — 13 (CO4) (PO2)

b) The 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 the customer feedback. Explain the stages of creating an experience map through a wheel representation based on the following customer feedback points: 12 (CO4) (PO3)

- Difficulties in finding the desired product
- Confusion regarding sizing and fit
- Easy product ordering process
- Prompt delivery and shipment tracking facility
- After sales service

6. a) Suppose you as a researcher want to investigate whether using a new assistive mouse controller that is operated with a head-mounted device affects computer input speed and accuracy. The experiment involves entering data into a computer using the new assistive mouse controller and a traditional mouse.

i. What are the independent variables and confounding variables you would test? Explain. 6 (CO5) (PO1)

ii. Explain how you would conduct between-subjects and within-subject experiment. 6 (CO5) (PO2)

iii. Do you need any ethical approval to conduct the research experiment? Explain your answer. 6 (CO5) (PO2)

b) Write an example application scenario where you can use Augmented Reality (AR)/ Virtual Reality (VR) technologies in the field of Computer-Supported Collaborative Works (CSCW). 7 (CO1) (PO1)