1. Fitts’ Law (20 pts.)

Fitts’ Law is a commonly used model for predicting human performance:

\[ \text{MovementTime} = a + b \cdot \log_2 \left( \frac{\text{Distance}}{\text{Width}} + 1 \right) \]

i. Explain Fitts’ Law. What aspect of human performance does it predict? (4 pts.)

ii. Imagine you were designing a graphical calculator application with a mouse-based interface. How can Fitts’ Law guide your design? (4 pts.)

iii. Computer games are intentionally designed to challenge a player’s skills. How can you use Fitts’ Law to achieve this? (4 pts.)

iv. A standard Fitts’ Law Reciprocal Tapping Task (Figure 1) requires a user to tap or point at two targets as quickly as possible, moving back and forth between them. For the paper “Quantitative analysis of scrolling techniques”, Hinckley et al used a variant of this task, the Reciprocal Framing Task, to compare scrolling performance using various devices (such as the scroll-wheel).

   What is the Reciprocal Framing Task? (2 pts.)
   Why is it similar to the Reciprocal Tapping Task? (2 pts.)
   What are Distance and Width in the Reciprocal Framing Task? (4 pts.)

2. Menus and Forms (20 pts.)

i. For tree-structured menus, is it better to have deep-and-narrow menus, or shallow-and-wide menus? Why? (6 pts.)

   Get account balance  Dispute transaction  Update phone number
   Report stolen ATM card List recent transactions Transfer funds
   Update address Request statement copy Print check copy

   Figure 2: Bank customer support requests

ii. Imagine that you are designing a customer support website for a bank. The website has a menu to for the user to choose from for particular requests. Users can have multiple accounts, and for each account, they may choose a request from Figure 2. Design this menu, and explain why you have chosen your particular organization. (8 pts.)
iii. Frequent menu users can become annoyed if they must make several menu selections to complete a simple task. Suggest one way you can refine the menu approach to accommodate expert or frequent users. (4 pts.)

3. Collaboration (20 pts.)

<table>
<thead>
<tr>
<th>Same Time</th>
<th>Different Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario: E.g. during a week-long workshop to learn how to design a website.</td>
<td></td>
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<tr>
<td>Interface: An electronic whiteboard</td>
<td></td>
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Table 1: Collaborative Interfaces

i. Collaborative interface can be grouped into a 2-by-2 time/space matrix (Table 1). For the three unfilled boxes, answer the following questions (one has been filled for example):
   - Give an example scenario where you will use this interface. (3×2 pts.)
   - Give an example of this type of collaborative interface. (3×2 pts.)

ii. Imagine that you are the organizer of the World-wide Forum on Reducing Vehicle Emission, which anticipates millions of participants across the globe. Which of the above strategies will you choose and why? (8 pts.)

4. Command and Natural Language (20 pts.)

i. In science fiction such as Star Trek, it is popular to depict people controlling computers through speech recognition (SR), by speaking to the computer—“Computer, turn on the lights”:
   - Why was SR believed to be so promising? (4 pts.)
   - Explain one technological reason that limits the use of SR today. (4 pts.)
   - Explain one psychological reason that makes SR unsuitable for many tasks. (4 pts.)

ii. Command languages interaction (CLI), despite being “unnatural”, are attractive for certain task:
   - List one situation when CLI can be attractive for users. (4 pts.)
   - Explain one advantage of CLI over SR. (4 pts.)

5. Balancing Function and Fashion (20 pts.)

i. Color displays are attractive to users and can often improve task performance, but the danger of misuse is high. List three guidelines for using color and give an example of each. (3×4 pts.)

ii. Imagine that you have developed a competitor website to Flickr where people can not only upload photos to share, but also have a service to automatically identify people and objects in their photo. Due to the complexity of your program, it takes up to a minute to complete the identification process. How can you design the interface to mask the slowness, such that users will not be turned away? (8 pts.)