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

MID SEMESTER EXAMINATION   SUMMER SEMESTER, 2022-2023
DURATION: 1 HOUR 30 MINUTES   FULL MARKS: 75

CSE 4885: 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 with
corresponding COs and POs in parentheses.

1. a) Suppose you are tasked to design and develop a workplace well-being and stress manage-
ment App due to the evolving dynamics of modern work environments, where professionals
navigate stressors and challenges. The App offers tangible solutions for personalized stress
assessment, adaptive coping, and fostering a supportive community. In this context, con-
cerning the interrelated Human-Computer Interaction (HCI) aspects, answer the following:

    i. How can the app practically enhance social connectivity among professionals, fostering   5
        virtual community building and peer support?   (CO1)
                                                                           (PO1)

    ii. In practical terms, how does the app align with human information processing, espe-   5
         cially in providing personalized stress assessments that consider cognitive processes?   (CO1)
                                                                            (PO1)

    iii. Provide examples illustrating how the app practically interacts with various input/out-   4
         put devices, ensuring a seamless user experience across different devices in real-time sce-   (CO1)
         narios.   (PO1)

    iv. What design approaches are practically employed in the app's development to ensure   5
         that it is user-centered and caters to the needs of professionals?   (CO1)
                                                                                (PO1)

   b) Consider a captcha-based user login interface where a 4x4 grid of images is presented to the   6
     user. The task is to find and recognize three specific objects, such as motorcycles, within the   (CO1)
     grid of 16 images. Once the user identifies these objects, s/he is required to click the "Submit"   (PO1)
     button. The Model Human Processor (MHP) constants are given, as perceptual cycle time
     (PCT) is 100 ms, cognitive processing time (CPT) is 70 ms, and motor processing time (MPT)
     is 120 ms. Calculate the total time required for the user to complete the task using MHP.

2. a) In a graphical user interface, a pointing task involves four targets labeled as A, B, C, and D,   9
     placed at varying distances from the starting point. The distances (D) from the starting point   (CO1)
     to the center of each target are as follows: $D_A = 120$ pixels, $D_B = 160$ pixels, $D_C = 100$ pixels,   (PO1)
     and $D_D = 140$ pixels. The widths (W) of the target areas are: $W_A = 30$ pixels, $W_B = 20$ pixels,
     $W_C = 25$ pixels, and $W_D = 15$ pixels. Constants for movement time (MT) calculations are,
     $a = 100$ ms, $b = 50$ ms. Calculate human throughput using Fitts' law for each target and
     determine which target provides the highest throughput.

   b) In a collaborative virtual design platform, architects and interior designers engage in shared   9
     virtual reality (VR) sessions to collaboratively work on a detailed 3D model of an office space.   (CO2)
     Users wear VR headsets for an immersive experience, aiming to enhance the collaborative   (PO2)
     design process. Identify the physiological and psychological depth cues relevant to achieving
     the following tasks and explain within 1-2 lines of justification for each.

    i. Architects and interior designers need to precisely adjust the placement of furniture   4
         items within the virtual office space with varied distances between objects. Users ma-   (CO2)
         nipulate objects using hand controllers to achieve accurate positioning.   (PO2)

ii. The virtual environment includes textured walls with visible bricks and wood grains. Users navigate the space and assess design elements in an occluded environment. **4** (CO2) (PO1)

iii. The VR environment simulates realistic lighting conditions, with sunlight streaming through windows and casting shadows across the floor. Users can adjust the time of day to observe changing light patterns. **4** (CO2) (PO1)

iv. Users have the option to adjust the stereo separation settings in their VR headsets to optimize depth perception. This customization allows users to find the most comfortable viewing experience. **4** (CO2) (PO1)

3. a) Suppose you want to design a command line application for a certain task. The application has up to 30 configurable parameters. In your current design, the user may pass the value of each of the arguments or parameters while calling it from the terminal. Though `help` can be invoked to list down all the possible parameters, novice users still find it difficult to properly use the application. In many cases, for a certain user or environment, a lot of the parameters remain the same. For simplicity of understanding, the invocation of a command line tool, `gcc` for compiling a single C file is:

```
gcc filename.c -o Application
```

The program takes 3 arguments, the first one being the file name to compile, then `-o` to indicate that the next argument would be the output file name/path and then accordingly, the output file name. Now based on this scenario, answer the following questions.

i. Point out how human memory, both short-term and long-term, can affect the usability of the aforementioned application. **5** (CO2) (PO1)

ii. Propose an ideal solution (a single one based on your decision) to the problem of having 30 parameters in the aforementioned program. You cannot decrease the number of parameters **5** (CO2) (PO3)

b) Suppose you are hired as an interaction designer to evaluate user interactions in a newly developed mobile banking service application. This application allows users to perform financial transactions, check account balances, and manage their accounts using touch gestures on their smartphones. Users input commands through the app, and the system provides feedback on the execution of these commands. Based on the Abowd and Beale interaction framework, identify and explain the interaction problems (articulation, performance, presentation, and observation) that may exist (one or more) for the following tasks within 1-2 line justification for each problem you found.

i. Users attempt to transfer money to another account using the app. Some users encounter difficulties in accurately inputting recipient details, leading to errors in the transaction, and there are delays in the system's response to transfer requests. **5** (CO3) (PO1)

ii. Users navigate through the app to check their account statements. Some users express confusion with the presentation of financial details, finding it difficult to interpret the information regarding deposits, withdrawals, and balances. **5** (CO3) (PO1)

iii. Users attempt to change their account PIN using the app. However, there are reports of users struggling to observe the confirmation prompts for the new PIN, leading to uncertainty about the success of the PIN change process. **5** (CO3) (PO1)