Solution:

National University of Computer and Emerging Sciences

Lahore Campus

0027

Human Computer Interaction (CS2007, CS4060)

Sessional-I Exam

Total Time (Hrs): 1
Total Marks: 70
Total Questions: 7

Date: September 24th 2024

Course Instructor(s)

Ms. Kiran Khurshid

Roll No _____ Section _____ Student Signature _____

Q. No.	Marks obtained	Q. No.	Marks obtained	Q. No.	Marks obtained
1 a		3 a		5	
1 b		3 b		6	
2		4		7 a + b	

Attempt all questions on the question paper. Answer sheets are not required.

CLO #1: Explain the difference between good and bad design

Q1) a): Match the option in the left column with the most suitable option in the right most column. Write down your chosen option in the center. [10 marks]

Scenario	Ans.	Concept
Prolonged usage of a keyboard causes the wrist of the user to ache	d	a) The gulf of evaluation
Systems in which haptic feedback helps in enhancing user experience	f/i	b) Memory
The gap between the user and the system when the user decides how to use the system	j	c) Listening
Distractions caused by using mobile phone while driving	g	d) Ergonomics
Accentuate the intonation of artificially generated speech voices	c	e) Haptic Perception
Using biometric verification instead of passwords for logging in to banking app	b	f) Virtual reality
The gap between the user and the system when the user checks the current state of the system	a	g) Attention
The sense which tells us information on how to distinguish hot from cold objects	e	h) Kinesthetic
Awareness of the surroundings through body movements	h	i) Pervasive computing
Technology where users can seamlessly communicate with computers	i/f	j) The gulf of execution

Q1 b): Specify three main ingredients of a usable design: Preece:- [3 marks]

1) Effectiveness / Easy-to-learn
2) Efficiency / Effective to use
3) Satisfaction. / Provides enjoyable UX

CLO #2: Analyze and critique interfaces

Q2: Specify which *translation* of The Abowd-Beale's Interaction Framework best explains the behavior of the following systems and explain why that translation applies. [6 marks]

a) A graph shows the count of grades given in a particular course. The components in the graph are not labeled.
Translation: Observation (output to task/user)
Why: User does not interpret the presented output properly.

b) A user presses START button to turn off the television
Translation: Articulation (user to input language)
Why: User does not know how to give input to the system.

c) A user may not interpret the play station icon on the controller correctly.
Translation: Articulation (task/user to input lang.)
Why: Same as b.

CLO #2: Analyze and critique interfaces

Q3) a): Specify the Human Error Type and recommend solution to avoid that specific error. [4 marks]

i) While cleaning a hand blender, user presses the start button of the blender, accidentally.
Error type: Slip
Recommended solution: Button placement / confirmation.

ii) User long presses the filename in a list of files, in a mobile app, thinking he will see further options, but instead long press does nothing.
Error type: Mistake
Recommended solution: Better understanding of the system.

Q3) b): The acuity of which color is low and why? [2 marks]

Blue, 3-4% of the fovea is occupied by cones which are sensitive to blue light.
Acuity is the ability to perceive fine detail

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CLO #3: Evaluate the usability and effectiveness of various software products

Q4) Write down the three types of users with their definition. Give one example of each.[9 marks]

Type of user	Definition	Example
Primary	Work regularly & directly with product	
Secondary	Infrequently or through an intermediary	
Tertiary	Affected by the system or purchasing decision-maker.	

Novice, expert, casual or frequent user.

CLO #4: Design and develop user interfaces providing effective usability and user experience

Q5) What input and output devices would you use for the following systems? If appropriate, indicate why the conventional keyboard, mouse and CRT screen may be less suitable. [9 marks]

a) Tourist information system installed at an airport

Input: Touchscreen / mic / keyboard / QR or barcode scanner / RFID Readers / camera / motion / sensor / vis / haptic feedback / LED indic

Output: " / high res display / speakers / tactile / buttons / as input

Why? Easy and direct interaction. No mouse/keyboard as it is a public place.

b) Tractor-mounted crop-spraying controller

Input: Touch-sensitive keypad (Numerical input / no text)

Output: LED display.

Why? A hostile environment with mud and chemicals. Ordinary keypads would get clogged.

c) Air traffic control system

Input: Several specialized displays, light pen/stylus, (folding) keyboard

Output:

Why? Immediately available info + rapid interaction.

CLO #4: Design and develop user interfaces providing effective usability and user experience

Q6: a) How is Command Line better for expert users than for novices? [2 marks]

Commands must be remembered with no cues to indicate which command is needed.

b) Write down one advantage and one disadvantage of Natural Language Interaction Style. [2 marks]

Does not need to remember commands in computer language or lose in a hierarchy of menus. Disadvantage: Ambiguity

c) How can a person without limbs (quadriplegic) give input to the computer? What are such systems called? [2 marks]

Voice / eyegaze speech recognition systems.

Voice-controlled systems / voice UI / voice activated.

d) Briefly explain the concept of trade-off in design. [3 marks]

Achieving goals within constraints is design. Trade off is choosing between preferences of goals or constraints.

5) b) I/P: Touchscreen with (Rugged Design)

Also accepted ans:- Prototype Evaluation Reqs — Analysis — Design — Implement

CLO #4: Design and develop user interfaces providing effective usability and user experience

Q7) a) What are the four main activities of a simple interaction design lifecycle model? Explain each of them in one sentence. [8 marks]

Activity 1: Discovering Reqs.
Explain: Discovering something new about the world and defining what will be developed. (Understanding the target users and support/use & product can provide)

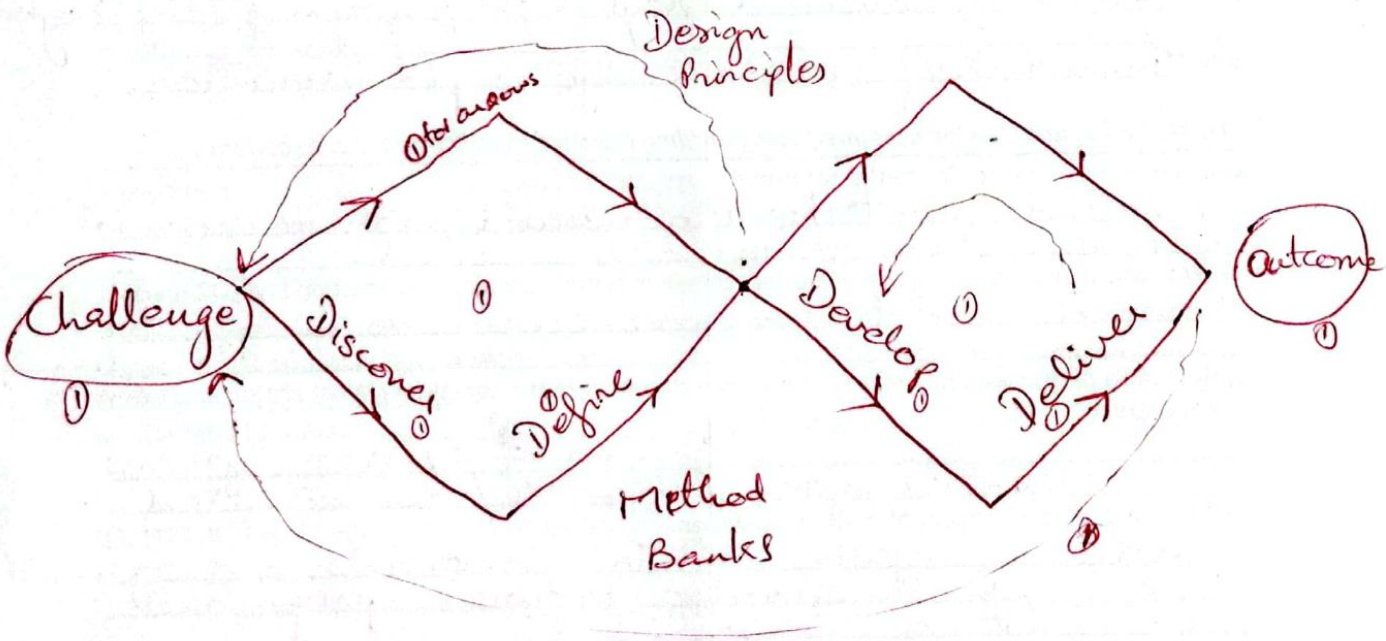
Activity 2: Designing alternatives
Explain: Develop phase: Conceptual Design and Concrete design.

Activity 3: Prototyping
Explain: Develop phase: A sample product to evaluate the behavior and appearance of it.

Activity 4: Evaluating
Explain: Deliver phase: Testing solutions at a small scale. Determining the usability and acceptability.

Q7) b) Draw the double diamond of design. [10 marks]

Engagement



Leadership

1 mark bonus for eng/method/Principles/ Method banks/ Divergent/ Convergent thinking

Deliver/Deploy both accepted.

Q.5

a) Tourist information system

Input Devices:

1. Touchscreen Interface / kiosk
2. Voice Recognition (Microphone)
3. On-Screen Keyboard
4. QR Code or Barcode Scanner
5. NFC/RFID Reader
6. Gesture-Based Input (Camera or Motion Sensor)
7. Multilingual Interface Selector

8.

Output Devices:

1. High-Resolution Display Screens / LED / LCD / Touch Screen Monitor / kiosk
2. Speakers/Audio Output
3. Headphone Jack or Bluetooth Audio Output
4. Printers (for maps, directions, or tickets)
5. Visual or Haptic Feedback on Touchscreen
6. Digital Signage for Visual Notifications
7. Multilingual Audio Output
8. LED or Lighting Indicators

Why? Keyboard and mice are not suitable in public places, due to high risk of loss and/or damage (hence costly and would require regular maintenance)

b) Tractor-mounted crop-spraying controller

Input Devices:

1. Touchscreen Interface (Rugged)
2. Physical Buttons/Dials/Knobs
3. Voice Input (Microphone)
4. Joystick or Lever Controls
5. GPS Sensors
6. Proximity or Distance Sensors
7. NFC/RFID Reader

8) haptic

Output Devices:

1. Display Screen (Rugged, High-Contrast)
2. Audible Alerts (Speakers/Buzzer)
3. Haptic Feedback (Vibration)
4. LED Indicators
5. Real-Time Mapping Output (GPS Integration)
6. Speakers/Audio Output (Multilingual)

7. Heads-Up Display (HUD) or AR Glasses

Why? Keyboards and mice are not suitable in dirty, muddy and rough conditions. Farmers may also find difficult to operate them (difficult to learn, or to use while driving)

c) Air traffic control system

Input Devices:

1. Radar Interface
2. Keyboard and Mouse
3. Joystick or Trackball
4. Touchscreen Interface
5. Voice Recognition (Microphone)
6. Flight Strip Printers/Scanners
7. Specialized Control Panels (e.g., buttons, dials)

Output Devices:

1. High-Resolution Multi-Display Monitors
2. Radar Display Screens
3. Audio Alerts (Speakers)
4. Headset for Voice Communication
5. LED Indicators
6. Flight Strip Displays
7. Haptic Feedback Devices

Why? Immediately available info and rapid interaction

National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Human Computer Interaction	Course Code:	CS 422
Program:	CS	Semester:	Spring 2018
Duration:	60 Minutes	Total Marks:	3+4+4+5+2
Paper Date:	26-FEB-18	Weight	15
Section:	ALL	Page(s):	2
Exam Type:	Midterm-I		

Student : Name:_____ Roll No._____ Section:_____

Instruction/Notes: No rough sheets!

1: In each of the following cases, specify which type of reasoning is used.

a. You bought software from a shop XYZ and it had a virus. Your friend tells you that he bought software that had virus too. You assume it was also from XYZ.

_____Abductive_____

___

b. You use an ABC editor that uses ctrl-9 to create a pdf file of the document. You try to use ctrl-9 to create a pdf file in MS word.

_____Inductive_____

__

c. A novice user does not use shortcut keys. You saw that your friend did not use shortcut key to save his work. You think he is a novice user.

_____Abductive_____

___

2: Indicate which **input** mechanism (i.e. device or system), and **output** mechanism is appropriate for each of the following cases.

a. You need to install a system in the Drewar Fort where tourist can get information about the fort like its history, various sites etc.

Input mechanism: Touch sensitive screen

Output mechanism: The same screen used for touch sensitive screen

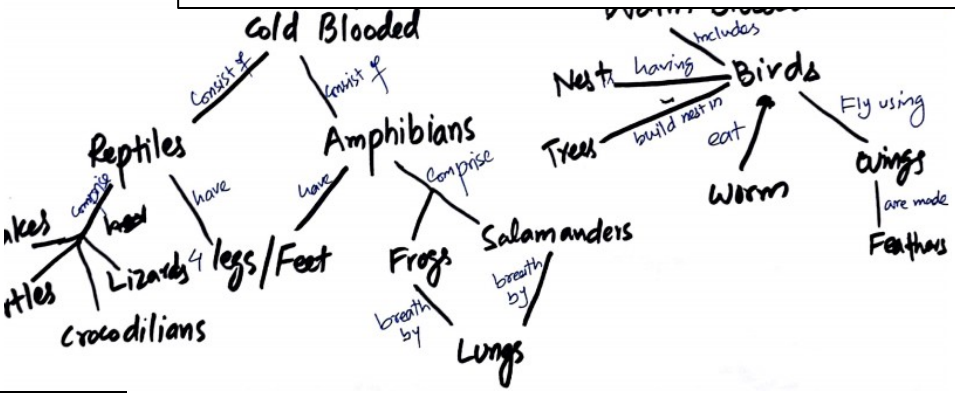
b. You need to develop a word processor for a person who cannot use his limbs.

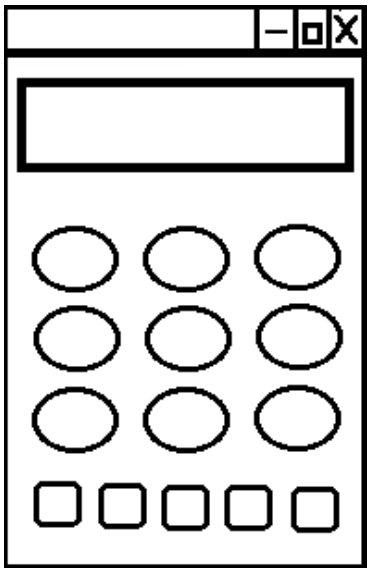
Input mechanism: speech/voice/audio input

Output mechanism: lcd/crt monitor/screen

3: Can the calculator given below utilize the concept of “infinite width”? If no, explain why? If yes, redraw the calculator that applies this concept.

No, since the calculator is a dialog based application that does not run on full screen. This calculator has the icon for full screen, but usually calculator applications are not meant to run on full screen so most likely if the calculator is maximized it will still remain of the same size.





4: Read the following passage carefully and create a Semantic Network Model. Start from the most basic entity, Animal, and then proceed further accordingly. Label the links between the objects with attributes mentioned with each object in the paragraph.

“There are two main classes of animals based on blood type: Cold blooded and Warm blooded. Cold Blooded Animals, such as reptiles and amphibians that cannot control their body temperature and therefore become sluggish in cold weather. Reptiles are tetrapod (having four feet, legs or leg like appendages) animals, comprising turtles, crocodilians, snakes, lizards etc. Amphibian, comprises frogs and salamanders, adult animals of this class breathing by lungs. Warm blooded Animals, such as birds that maintain a constant body temperature regardless of the temperature of the surroundings. Birds have some properties such as, they fly using their Wings and eat worm. Their Wings are made of Feathers and build their nests in the Trees.”

5: Explain anti-aliasing with the help of diagram **only**.

Two images, One with black and white pixels. The other with some gray ones.

For rough work:

National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Human Computer Interaction	Course Code:	
Program:	BS-CS	Semester:	Fall 2019
Duration:	60 Minutes	Total Marks:	25
Paper Date:	23rd September 2019	Weight:	15%
Section:	Section C and D	Page(s):	2
Exam Type:	Midterm-I		

Student : Name:_____ Roll No._____ Section:_____

Instruction/Notes: Attempt all questions. Your answers should be precise and to the point. Use the given space only. Extra sheets not allowed. Avoid cutting or overwriting.

Q 1. Consider any web browser that is used to navigate the World Wide Web. List down any 5 features in the browser that are designed to reduce long term memory load for the user. For example, the "autofill" feature in the address bar, enables the user to get suggestions of previously visited web pages, just when he/she starts to write a URL. This reduces the memory load of the user. List down five other features of a web browser which reduce the user's long term memory load: (5 marks)

1. ___predictive text _____
2. ___Bookmarks_____
3. ___Maintain history _____
4. ___Save offline searches_____
5. ___Option of restoring all tabs if explorer crashes_____

Q 2. Alexa, Siri and Google Assistant are examples of speech recognition systems. Identify five challenges from HCI perspective, in building speech recognition systems. (5 marks)

1. _Contextual Ambiguity_____
2. _Different accents _____
3. _Different languages_____
4. _More than one meaning of words_____
5. _Different pronunciations of the same words_____

Q 3. A library kiosk is being developed to facilitate the students coming to the library. It will also reduce the requirement of having library staff. The kiosk will enable the students to issue books, return books, search for books and reserve books. Identify what kind of interface will the library kiosk have. Point out explicitly the hardware requirements for input and output. (5 marks)

Please see this video to have an idea of the kind of library kiosk I want students to visualize: https://youtu.be/do418ylDQ_M _____

Q 4. Identify the type of reasoning being used in the given scenarios. (5 marks)

Given scenario	Type of reasoning
When I long press any button on a smartphone, a menu pops up. So I'll long press "delete" button, to see a menu related to delete functionality.	Deductive
All ATMs I have ever visited till now have touch screens, so the ATM of the bank near my university will also have a touch screen interface.	Inductive
Whenever a user buys a security patch for his system from Microsoft's website, the color scheme of his OS changes. One day the user turned on his computer and the color scheme had changed. He got worried that an unauthorized purchase has been made.	Abductive
The Word files in my laptop are not opening. I think there is a virus in my computer.	Abductive
I have been driving since 10 years. Whenever I turn the key anti clockwise fully, my car keys come out. In this new (automatic) car, when I'm turning my car keys anticlockwise the key is not being released, while I think it should come out.	Inductive

Q 5. a) Write down three examples of hardware which can be used to enter English text in a computer/device. (3 marks)

1. Qwerty Keyboard
2. Chord Keyboard
3. Mic (Speech recognition system)

b) Write down 4 features of a virtual keyboard in a smartphone, which enhance the user experience: (2 marks)

1. Swipe screen
2. Emojis
3. Speech
4. Predictive text

National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Human Computer Interaction	Course Code:	CS 422
Program:	CS	Semester:	Spring 2020
Duration:	60 Minutes	Total Marks:	30
Paper Date:	26-FEB-2020	Weight	15
Section:	ALL	Page(s):	5
Exam Type:	Midterm-I		

Student : Name:_____ Roll No._____ Section:_____

Instruction/Notes: Solve on question paper, no rough sheets!

Question1. What input and output devices would you use for the following systems? For each, compare and contrast alternatives, and if appropriate indicate why the conventional keyboard, mouse and CRT screen may be less suitable. **(3 x 4 Points)**

(a) Portable word processor for blind and normal users.

Input Device1:

Portable word processor

The determining factors are size, weight and battery power. However, remember the purpose: this is a word processor not an address book or even a data entry device.

(i) LCD screen – low-power requirement

(ii) trackball or stylus for pointing

(iii) real keyboard – you can't word process without a reasonable keyboard and stylus handwriting recognition is not good enough

(iv) small, low-power bubble-jet printer – although not always necessary, this makes the package stand alone. It is probably not so necessary that the printer has a large battery capacity as printing can probably wait until a power point is found.

Input Device2:

Output Device1:

Output Device2:

(b) Tourist information system

Input Device1:

Tourist information system
This is likely to be in a public place. Most users will only visit the system once, so the information and mode of interaction must be immediately obvious.
(i) touchscreen only – easy and direct interaction for first-time users (see also Chapter 3)
(ii) NO mice or styluses – in a public place they wouldn't stay long!

Input Device2:

Output Device1:

Output Device2:

(d) Air traffic control system

Input Device1:

Air traffic control system

The emphasis is on immediately available information and rapid interaction. The controller cannot afford to spend time searching for information; all frequently used information must be readily available.

(i) several specialized displays – including overlays of electronic information on radar

(ii) light pen or stylus – high-precision direct interaction

(iii) keyboard – for occasional text input, but consider making it fold out of the way.

Input Device2:

Output Device1:

Output Device2:

(e) Worldwide personal communications system

Input Device1:

Basically a super mobile phone! If it is to be kept on hand all the time it must be very light and pocket sized. However, to be a 'communications' system one would imagine that it should also act as a personal address/telephone book, etc.

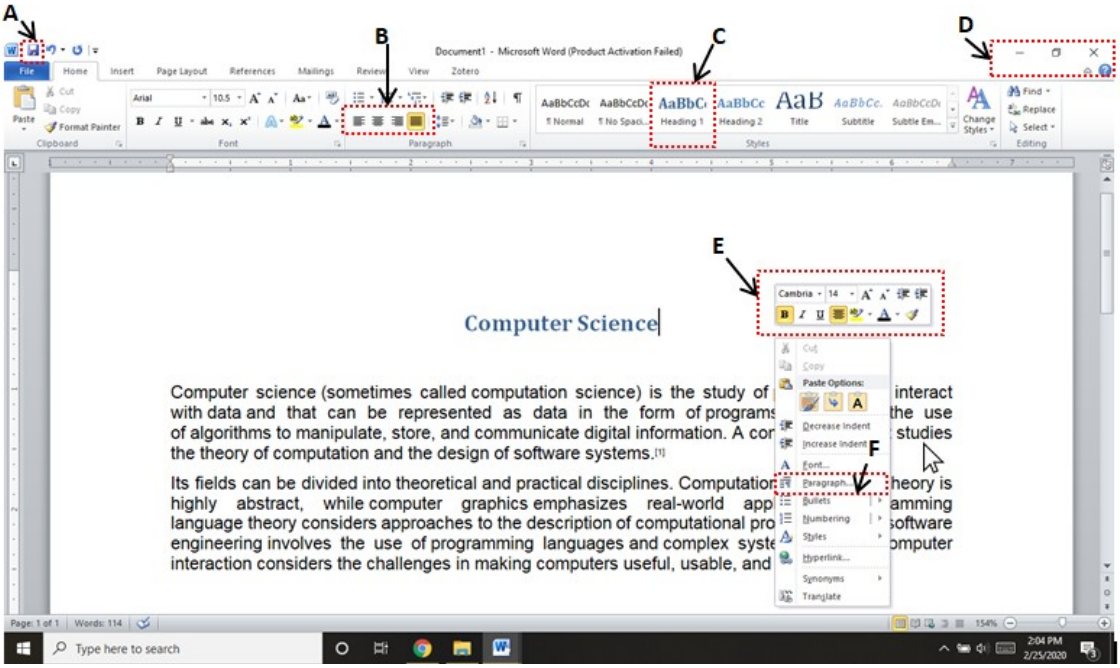
(i) standard telephone keypad – the most frequent use
(ii) small dedicated LCD display – low power, specialized functions
(iii) possibly stylus for interaction – it allows relatively rich interaction with the address book software, but little space
(iv) a 'docking' facility – the system itself will be too small for a full-sized keyboard(!), but you won't want to enter in all your addresses and telephone numbers by stylus!

Input Device2:

Output Device1:

Output Device2:

Question 2: Consider the following interface and labels.



According to Fitt's Law which regions of the screen (Labeled as A, B…, F) rank each with ease and accuracy to target with reference to cursor position. (Rank 1 as easiest or most accurate) **(12 Points)**

Rank	Label	Reason
1		
2		
3		
4		
5		
6		

Question4: What can a system designer do to minimize the memory load of the user? Give at least two options. **(4 Points)**

Discuss two ways of remembering. The interface designer can where possible allow recognition by providing information up front (e.g. labeled buttons). Where this is not possible support recall by using cues such as iconic images, categories of menu item. The answer may also discuss short term memory where chunking and restricting number of items are important.

Question5: A typical computer system comprises a QWERTY keyboard, a mouse and a color screen. There is usually some form of loudspeaker as well. You should know how the keyboard, mouse and screen work. If you were designing a keyboard for a modern computer, and you wanted to produce a faster, easier-to-use layout, what information would you need to know and how would that influence the design? **(2 Points)**

The information needed to redesign keyboard layout would include the frequency of letters or commands to be issued by the keyboard as well as empirical data on motor actions of the hands and fingers in performing typing actions. Various modified keyboard layouts do exist, such as the DVORAK keyboard, but none has been successful in supplanting the QWERTY standard.

- **common letters under dominant fingers**
- **biased towards right hand. 56% of keystrokes are made with the right hand**
- **Less switching between hands**
- **10-15% improvement in speed and reduction in fatigue**

/ 22 +2

National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Human Computer Interaction	Course Code:	CS 422
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	Duration:	60 Minutes	Total Marks:	30
	Paper Date:	26-FEB-2020	Weight	15
	Section:	ALL	Page(s):	5
	Exam Type:	Midterm-I		

Student : Name: Abdullah Fawad Roll No. 17L-6321 Section: CS-6A

Instruction/Notes: Solve on question paper, answer sheets are not required.

Question1. What input and output devices would you use for the following systems? For each, compare and contrast alternatives, and if appropriate indicate why the conventional keyboard, mouse and CRT screen may be less suitable. **(3 x 4 Points)**

(a) Portable word processor for blind and normal users.

Input Device1:

Speech ~~Sound~~ to text converter/ microphone. The blind user will not have a good time using a conventional keyboard. This input device will allow he to sipply speak the letters he wants to write to input them.

Input Device2:

A keyboard that pronounces every ~~word~~ letter inputted or gives a different vibration or sound effect for every keystroke. This will be useful for the blind user and the sound can be turned off by the normal user. A normal keyboard will not work because the blind user will not know whether typing

Output Device1:

Speaker. This output device will pronounce the words the user wrote. A CRT screen is not suitable because this will also be used by blind people who will not be able to read what they write on the simple screen.

Output Device2:

A special screen with computed feedback system which will have different feedback for different actions. The screen will be designed using using materials and colors that make it blind person friendly.

Aj

2 V.8

(b) Tourist information system

Input Device1:
A conventional keyboard would work here. The user can type in the name of the location he/she wants information about.

Input Device2:
A conventional mouse with which the user can simply point and click on the location he is after. An alternative can be touch screen where user will simply touch the screen.

Output Device1:
A simple color CRT screen will suffice to show the user information about whatever tourist location he inputted. An alternative would be a touch screen, which could also work, and could be used for input as well.

Output Device2:
Speaker for announcements, audio results and possibly narating directions or instructions

(c) Air traffic control system

Input Device1:
Microphone. This would allow the traffic controllers to communicate with one another so they can do as good of a job as possible, and with pilots

Input Device2:
A simple keyboard where the traffic observer or pilot can simply write instruction, question or ask for status update etc.

Output Device1:
A CRT screen that displays routes, airports, charters etc, all denoted by different colors for easy differentiation

Output Device2:
An ~~alarm~~ alarm. The alarm will act as an alert device, that will sound whenever an airplane is in SOS mode, or whenever there is a chance of an impending collision. An alternative is a speaker that will perform the same action, but using words instead of an alarm sound.

3

.) Worldwide personal communications system

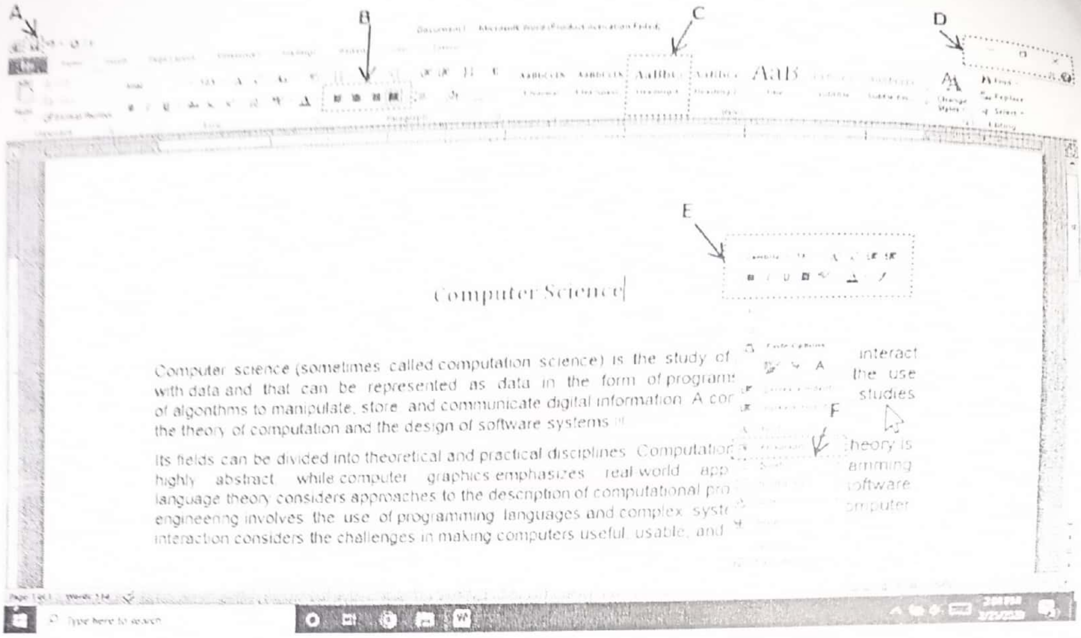
Input Device1:
A keyboard. The user can simply type a message to send over the communications network. An alternate can be a touch screen, which would be more modern, and eliminate the need for a physical keyboard

Input Device2:
Microphone. The user can send audio messages using this. An alternative could be ~~video~~ a front facing camera, which will allow the user to video call and talk to whoever they're communicating with.

Output Device1:
A ~~color~~ large screen, which will display messages, notifications, video feeds and basically be a central hub for every feature of the communication system.

Output Device2:
A speaker that will read a ringtone whenever there is a new message, it will act as a notification tool. It will also play audio messages

Question 2: Consider the following interface and labels.



According to Fitt's Law which regions of the screen (Labeled as A, B, ...) ... ease and accuracy to target with reference to cursor position. (Rank 1 as easiest ... 12 Points)

Rank	Label	Reason
1	E	even though F is closer to the cursor ... bigger than F and ... making it easy to ...
2	F	F is a little smaller ... but it is very close to the cursor making it easy to target
3	D	D is large, somewhat close to the cursor position, and is situated in the corner of the screen, means it can be targeted easily
4	C	C is not very far from the cursor, but is not big enough in size, and is surrounded by other buttons and has dead space above it
5	B	B is far from the cursor position, is small, and is surrounded in close proximity by other buttons
6	A	The save button is very small and very far from the position of the cursor. It is also closely surrounded by similarly small buttons

estion3: What can a system designe... options. (4 Points)

A system designer can ... easier to memorize ... it bigger and ... different ...

Scanned with CamScanner

Question3: What can a system designer do to minimize the memory load of the user? Give at least two options. **(4 Points)**

2+0

A system designer can make sure the system UI is easier to memorize and simpler to read by making it bigger and using white pace and labelling with different fonts and weights. The designer can also incorporate a feedback system that will save everything the user presses or hovers over. This would mean the user does not have to memorize the interface, he will have a guide for his actions everytime. An ordinary Artificial system can also be added

Question4: A typical computer system comprises a QWERTY keyboard, a mouse and a color screen. There is usually some form of loudspeaker as well. You should know how the keyboard, mouse and screen work. If you were designing a keyboard for a modern computer, and you wanted to produce a faster, easier-to-use layout, what information would you need to know and how would that influence the design? **(2 Points)**

As far as the information is concerned, the user's preference would be a major consideration. The layout can be altered depending on whether user is handicapped or which hand is the most dominant hand, the design will then be changed to accomodate more convenience and ease for the user. The preference of the targeted market will decide a lot. An example can be if the user is right handed or has a handicapped left, the keyboard would have prominent letters on the right side, to lay and maximize the percentage of keystrokes being place with the right hand and vice versa