Internal Assessment Test 1 – MAY 2022

17CS832 - USER INTERFACE DESIGN

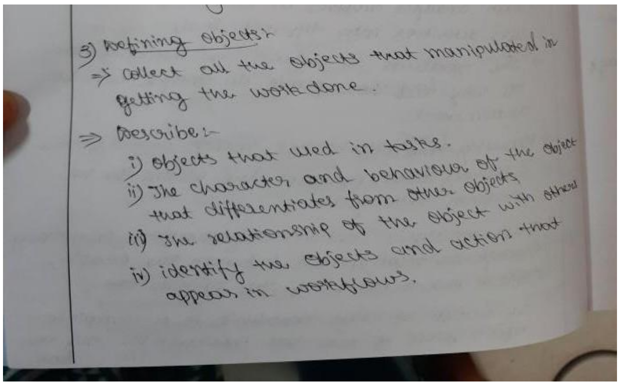
SOLUTION MANUAL

QNo	Solution
1.(a)	Define User Interface Design. Explain the importance and benefits of a good design User interface design is a subset of a field of study called *human - computer interaction* (HCI). Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way. **Importance of good design:** With today's technology and tools, and our motivation to create really effective and usable interfaces and screens, why do we continue to produce systems that are inefficient and Confusing or, at worst, just plain unusable? Is it because: 1. We don't care? 2. We don't possess common sense? 3. We don't have the time? 4. We still don't know what really makes good design? A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system. To many, *it is* the system, being one of the few visible components of the product we developers create. It is also the vehicle through which many critical tasks are presented. These tasks often have a direct impact on an organization's relations with its customers, and its profitability. **Benefits of good design:** ● Training costs are lowered because training time is reduced. ● Support line costs are lowered because fewer assist calls are necessary. ● Employee satisfaction is increased because aggravation and frustration are reduced. ● Customers benefit because of the improved service they receive. Studies have also shown that the proper formatting of information on screens does have a significant positive effect on performance. The benefits of a well-designed screen have also been under experimental scrutiny. A general rule of thumb: every dollar invested in usability returns $10 to $100 (IBM, 2001).
1.(b)	Discuss Direct and Indirect Manipulation **The Concept of Direct Manipulation** Direct Manipulation possess the following characteristics: **1. System is portrayed as extension of real world:** The system simply replicates actions and objects and portrays them on a different medium, the screen. **2. Continuous visibility of objects and actions:** Objects are continuously visible.Cursor action and motion occurs in physically obvious and intuitively natural ways.Nelson (1980) described this concept as "virtual reality," a representation of reality that can be manipulated. Hatfield (1981) is credited with calling it "WYSIWYG" (what you see is what you get). Rutkowski (1982) described it as "transparency," where one's intellect is applied to the task, not the tool. **3. Actions are rapid and incremental with visible display of results:** The results of actions are immediately displayed visually on the screen in their new and current form. **4. Incremental actions are easily reversible:** Finally, actions, if discovered to be incorrect or not desired, can be easily undone. **Earlier Direct Manipulation Systems**

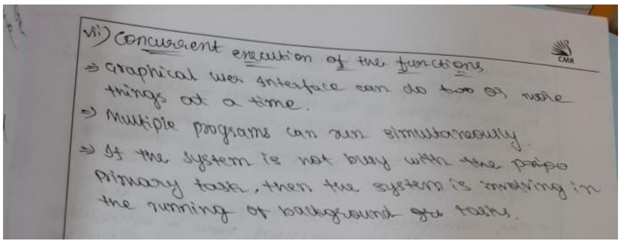
	The concept of direct manipulation actually preceded the first graphical system. The earliest full-screen text editors possessed similar characteristics. Screens of text resembling a piece of paper on one's desk could be created (extension of real world) and then reviewed in their entirety (continuous visibility). Editing or restructuring could be easily accomplished (through rapid incremental actions) and the results immediately seen. Actions could be reversed when necessary. **Indirect Manipulation** Direct manipulation of *all* screen objects and actions may not be feasible because of the following: ● The operation may be difficult to conceptualize in the graphical system. ● The graphics capability of the system may be limited. ● The amount of space available for placing manipulation controls in the window border may be limited. ● It may be difficult for people to learn and remember all the necessary operations and actions. Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols, and substitutes typing for pointing. Most window systems are a combination of both direct and indirect manipulation.
2	Differentiate between Printed pages and Web pages **Printed Pages versus Web Pages** ● **Page size:** Printed pages are generally larger than their Web counterparts. They are also fixed in size, not variable like Web pages. The visual impact of the printed page is maintained in hard-copy form, while on the Web all that usually exists are snapshots of page areas. The visual impact of a Web page is substantially degraded, and the user may never see some parts of the page because their existence is not known or require scrolling to bring into view. The design implications: the top of a Web page is its most important element, and signals to the user must always be provided that parts of a page lie below the surface. ● **Page rendering:** Printed pages are immensely superior to Web pages in rendering. Printed pages are presented as complete entities, and their entire contents are available for reading or review immediately upon appearance. Web pages elements are often rendered slowly, depending upon things like line transmission speeds and page content. Design implications: Provide page content that downloads fast, and give people elements to read immediately so the sense of passing time is diminished. ● **Page layout:** With the printed page, layout is precise with much attention given to it. With Web pages layout is more of an approximation, being negatively influenced by deficiencies in design toolkits and the characteristics of the user browser and hardware, particularly screen sizes. Design implication: Understand the restrictions and design for the most common user tools. ● **Page resolution:** the resolution of displayed print characters still exceeds that of screen characters, and screen reading is still slower than reading from a document. Design implication: Provide an easy way to print long Web documents. ● **Page navigation:** Navigating printed materials is as simple as page turning. Navigating the Web requires innumerable decisions concerning which of many possible links should be followed. Design implications are similar to the above 鈥 provide overviews of information organization schemes and clear descriptions of where links lead. ● **Interactivity:** Printed page design involves letting the eyes traverse static information, selectively looking at information and using spatial combinations to make page elements enhance and explain each other. Web design involves letting the hands move the information (scrolling, pointing, expanding, clicking, and so on) in conjunction with the eyes. ● **Page independence:** Because moving between Web pages is so easy, and almost any page in a site can be accessed from anywhere else, pages must be made freestanding. Every page is independent. Printed pages, being sequential, fairly standardized in organization, and providing a clear sense of place, are not considered

independent. Design implication: Provide informative headers and footers on each Web page.

3.(a) Define object in Graphical Systems. Differentiate between application and data orientation



5) Defining objects:-
=> collect all the objects that manipulated in getting the work done.
=> Describe:-
i) objects that used in tasks.
ii) The character and behaviour of the object that differentiates from other objects
iii) The relationship of the object with others
iv) identify the objects and action that appears in workflows.



vi) Concurrent execution of the functions
=> Graphical user interface can do two or more things at a time.
=> Multiple programs can run simultaneously
=> If the system is not busy with the primary task, then the system is involving in the running of background tasks.

3.(b) Write short notes on Human Interaction Speed

The speed at which people can perform using various communication methods has been studied by a number of researchers. They are:

1. **Reading**
2. **Listening**
3. **Speaking**
4. **Keying**
5. **Hand printing**

These speeds are also summarized in Table 1.3.

1. Reading. The average adult, reading English prose in the United States, has a reading speed in the order of 250–300 words per minute. Proofreading text on paper has been found to occur at about 200 words per minute, on a computer monitor, about 180 words per minute. Nontraditional reading methods have also been explored in research laboratories. One technique that has dramatically increased reading speeds is called Rapid Serial Visual Presentation, or RSVP. In this technique single words are presented one at a time in the center of a screen. New words continually replace old words at a rate set by the reader.

1. **Listening.** Words can be comfortably heard and understood at a rate of 150 to 160 words per minute. This is generally the recommended rate for audio books and video narration (Williams, 1998). Omoigui, et al, (1999) did find, however, that when normal speech is speeded up using compression, a speed of 210 words per minute results in no loss of comprehension.

2. **Speaking.** Dictating to a computer occurs at a rate of about 105 words per minute (Karat, et al., 1999; Lewis, 1999). Speech recognizer misrecognitions often occur, however, and when word correction times are factored in, the speed drops significantly, to an average of 25 words per minute. Karat, et al. (1999) also found that the speaking rate of new users was 14 words per minute during transcription and 8 words per minute during composition.

3. **Keying.** Fast typewriter typists can key at rates of 150 words per minute and higher. Average typing speed is

	considered to be about 60—70 words per minute. Computer keying has been found to be much slower, however. Speed for simple transcription found by Karat, et al. (1999) was only 33 words per minute and for composition only 19 words per minute. In this study, the fastest typists typed at only 40 words per minute, the slowest at 23 words per minute. Brown (1988) reports that two-finger typists can key memorized text at 37 words per minute and copied text at 27 words per minute. Something about the computer, its software, and the keyboard does seem to significantly degrade the keying process. (And two-finger typists are not really that bad off after all.) **4. Hand printing.** People hand print memorized text at about 31 words per minute. Text is copied at about 22 words per minute (Brown, 1988).
4	Explain the common usability problems in Web based system Mandel (1994) lists the 10 most common usability problems in graphical systems as reported by IBM usability specialists. They are: 1. Ambiguous menus and icons. 2. Languages that permit only single-direction movement through a system. 3. Input and direct manipulation limits. 4. Highlighting and selection limitations. 5. Unclear step sequences. 6. More steps to manage the interface than to perform tasks. 7. Complex linkage between and within applications. 8. Inadequate feedback and confirmation. 9. Lack of system anticipation and intelligence. 10. Inadequate error messages, help, tutorials, and documentation. **Web usability characteristics are:** 1. **Visual clutter.** A lack of —white space,‖ meaningless graphics, and unnecessary and wasteful decoration often turn pages into jungles of **visual noise**. Meaningful content lies hidden within the unending forest of vines and trees, **forcing the user to waste countless minutes searching** for what is relevant. Useless displayed elements are actually a form of visual noise. 2. **Impaired information readability.** Page readability is diminished by poor developer choices in **typefaces, colors, and graphics.** Use of innumerable typefaces and kaleidoscopic colors wrestle meaning from the screen. A **person's attention is directed towards trying to understand why the differences exist**, instead of being focused toward identifying and understanding the page's content. Backgrounds that are brightly colored or contain pictures or patterns greatly diminish the legibility of the overwritten text. 3. **Incomprehensible components.** Some design elements give the **user no clue as to their function**, leaving their purpose not at all obvious. Some icons and graphics, for example, are shrouded in mystery, **containing no text to explain** what they do. Some buttons **don't look at all** li**ke command buttons**, forcing the user to —minesweep‖ the screen with a mouse to locate the objects that can be used to do something. Command buttons or areas that give no visual indication that they are clickable often won't be clicked. Language is also often confusing, with the developer's terminology being used, not that of the user. 4. **Annoying distractions. Elements constantly in motion, scrolling marquees or text**, blinking text, or looping continually running animations compete with meaningful content for the user's eye's and attention—and destroy a page's readability**. Automatically presented music** or other sounds interrupt one's concentration, as do nonrequested pop-up widows, which must be removed, wasting more of the user's time. A person's senses are under constant attack, and the benefits afforded by one's peripheral vision are negated.

	5. **Confusing navigation.** A site's structure often **resembles a maze of twisting pages** into which the user wanders and is quite soon lost. Poor, little, or no organization exists among pages. The size and depth of many Web sites can eventually lead to a —lost in space‖ feeling as perceived site structure evaporates as one navigates. Embarking on a side trip can lead to a radical change in context or a path with no signposts or landmarks. Navigation links lead to dead-ends from which there is no return, or boomerang you right back to the spot where you are standing without you being aware of it. Some navigation elements are invisible. (See mystery icons and minesweeping above.) Confusing navigation violates expectations and results in disturbing unexpected behavior. 6. **Inefficient navigation.** A person must transverse content-free pages to find what is meaningful. **One whole screen is used to point to another.** Large graphics waste screen space and add to the page count. The path through the navigation maze is often long and tedious. Reams of useless data must be sifted through before a need can be fulfilled. Massive use of short pages with little content often creates the feeling that one is —link drunk. 7. **Inefficient operations.** Time is wasted doing many things. **Page download times can be excessive.** Pages that contain, for example, large graphics and maps, large chunky headings, or many colors, take longer to download than text. Excessive information fragmentation can require navigation of long chains of links to reach relevant material, also accelerating user disorientation. 8. **Excessive or inefficient page scrolling.** Long pages requiring scrolling frequently lead to the user's losing context as related information's spatial proximity increases and some information entirely disappears from view and, therefore, from memory. Out of sight is often out of mind. If **navigation elements and important content are hidden below the page top,** they may be missed entirely. To have to scroll to do something important or complete a task can be very annoying; especially if the scrolling is caused by what the user considers is an irrelevancy or noise. 9. **Information overload. Poorly organized or large amounts of information taxes one's memory** and can be overwhelming. Heavy mental loads can result from making decisions concerning which links to follow and which to abandon, given the large number of choices available. Or from trying to determine what information is important, and what is not. Or from trying to maintain one's place in a huge forest of information trees. One easily becomes buried in decisions and information. Requiring even minimal amounts of learning to use a Web site adds to the mental load. 10. **Design inconsistency.** Design inconsistency has not disappeared with the Web. It has been magnified. The business system user may visit a handful of systems in one day, the Web user may visit dozens, or many more. It is expected that site differences will and must exist because each Web site owner strives for its own identity. For the user's sake, however, **some consistency must exist to permit a seamless flow between sites.** Consistency is needed in, for example, navigation element location on a page and the look of navigation buttons (raised). The industry is diligently working on this topic and some —common practices‖ are already in place. The learning principle of rote memorization, however, is still being required within many sites. For example, the industry practice of using different standard link colors for unvisited sites (blue) and visited sites (purple) is often violated. This forces users to remember different color meanings in different places, and this also causes confusion between links and underlined text. Design guidelines for graphical user interfaces have been available for many years. Too often they are ignored (or the designer is unaware of them). Examples of inappropriate uses abound in design. The use of check boxes instead of radio buttons for mutually exclusive options, for example. Or the use of drop-down list boxes instead of combination boxes when the task mostly requires keyboard form fill-in. The Web is a form of the graphical user interface, and GUI guidelines should be followed. 11. **Outdated information.** One important value of a Web site is its —currentness.‖ Outdated information

	destroys a site's credibility in the minds of many users, and therefore its usefulness. A useless site is not very usable. **12. Stale design caused by emulation of printed documents and past systems.** The Web is a new medium with expanded user interaction and information display possibilities. While much of what we have learned in the print world and past information systems interface design can be ported to the Web, all of what we know should not be blindly moved from one to the other. Web sites should be rethought and redesigned using the most appropriate and robust design techniques available.
5	Discuss the models for determining basic business functions A requirement is an objective that must be met. A product description is developed and refined, based on input from users or marketing. The techniques listed are classified as direct and indirect. Direct methods consist of face-to face meetings with, or actual viewing of, users to solicit requirements. Indirect methods impose an intermediary, someone or something, between the users and the developers. 1. **Direct Methods** 2. **Indirect Methods** 3. **Requirements Collection Guidelines** **1. Direct Methods:2. Indirect Methods3. Requirements Collection Guidelines** **■ Establish 4 to 6 different developer-user links.** The more successful projects had utilized a greater number of developer-user links than the less successful projects. The mean number of links for the successful projects: 5.4; the less successful: 3.2. This difference was statistically significant. Few projects used more than 60 percent of all possible links. Effectiveness ratings of the most commonly used links in their study were also obtained. (Not all the above-described techniques were considered in their study.) On a 1 to 5 scale (1 = ineffective, 5 = very effective) the following methods had the highest ratings: Custom projects (software developed for internal use and usually not for sale): Facilitated Teams 5.0 User-Interface Prototype 4.0 Requirements Prototype 3.6 Interviews 3.5 Package projects (software developed for external use and usually for sale): Support Line 4.3 Interviews 3.8 User-Interface Prototype 3.3 User Group 3.3 **■ Provide most reliance on direct links.** The problems associated with the less successful projects resulted, at least in part, from too much reliance on indirect links, or using intermediaries. Ten of the 14 less successful projects had used none, or only one, direct link. The methods with the highest effectiveness ratings listed above were mostly direct links.
6	Explain the characteristics of GUI in detail 1. Sophisticated Visual Presentation 2. Pick-and-Click Interaction 3. Restricted Set of Interface Options 4. Visualization 5. Object Orientation 6. Use of Recognition Memory 7. Concurrent Performance of Functions **1. Sophisticated visual presentation:** Visual presentation is the visual aspect of the interface. It is what people see on the screen. The sophistication of a graphical system permits displaying lines, including drawings and icons. It also permits the displaying of a variety of character fonts, including different sizes

and styles. The display of 16 million or more colors is possible on some screens. Graphics also permit animation and the presentation of photographs and motion video.

The meaningful interface elements visually presented to the user in a graphical system include:

- windows - primary, secondary, or dialog boxes
- menus - menu bar, pulldown, pop-up, cascading
- icons - represent objects such as programs or files
- Assorted screen-based controls - text boxes, list boxes, combination boxes, settings, scroll bars, and buttons
- mouse pointer and cursor.

The objective is to reflect visually on the screen the real world of the user as realistically, meaningfully, simply, and clearly as possible.

2. Pick-and-click interaction:

To identify the element for a proposed action is commonly referred to as *pick*, the signal to perform an action as *click*.● The primary mechanism for performing this pick-and-click is most often the mouse and its buttons. The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).

● The secondary mechanism for performing these selection actions is the keyboard. Most systems permit pick-and-click to be performed using the keyboard as well.

3. A restricted set of interface options:

The array of alternatives available to the user is what is presented on the screen or what may be retrieved through what is presented on the screen, nothing less, nothing more. This concept fostered the acronym WYSIWYG.

4. visualization:

Visualization is a cognitive process that allows people to understand information that is difficult to perceive, because it is **either too voluminous or too abstract**. It involves changing an entity's representation to reveal gradually the structure and/or function of the underlying system or process. Presenting specialized graphic portrayals facilitates visualization.

The best visualization method for an activity depends on what people are trying to learn from the data. The goal is not necessarily to reproduce a realistic graphical image, but to produce one that conveys the most relevant information. **Effective visualizations can facilitate mental insights, increase productivity and more accurate use of data.**

5. Object orientation:

A graphical system consists of **objects and actions**. *Objects* are what people see on the screen.Objects can be composed of *subobjects*.

A) **IBM's Common User Access application** breaks objects into three meaningful classes:

1.Data

2.Container

3.device.

Data objects present information. This information, either text or graphics, normally appears in the body of the screen. It is, essentially, the screen-based controls for information collection or presentation organized on the screen.

Container objects are objects to hold other objects. They are used to group two or more related objects for easy access and retrieval. There are three kinds of container objects:

- Workplace
- Folders
- Workareas.The *workplace* is the desktop, the storage area for all objects. *Folders* are general-purpose containers for long-term storage of objects. *Workareas* are temporary storage folders used for storing multiple objects currently being worked on.

Device objects represent physical objects in the real world, such as printers or trash baskets. These objects may contain others for acting upon. A file, for example, may be placed in a printer for printing of its contents.

B) **Microsoft Windows** specifies the characteristics of objects depending upon the relationships that exist between them.These relationships are called collections, constraints, composites, and containers.

A ***collection*** is the simplest relationship—the objects sharing a common aspect. A collection might be the result of a query or a multiple selection of objects. Operations can be applied to a collection of objects.

A ***constraint*** is a stronger object relationship. Changing an object in a set affects some other object in the set. A document being organized into pages is an example of a constraint.

A ***composite*** exists when the relationship between objects becomes so significant that the aggregation itself can be identified as an object. Examples include a range of cells organized into a spreadsheet, or a collection of words organized into a paragraph.

A ***container*** is an object in which other objects exist. Examples include text in a document or documents in a folder. A container often influences the behavior of its content. It may add or suppress certain properties or operations of objects placed within it, control access to its content, or control access to kinds of objects it will accept.

Another important object characteristic is ***persistence***. Persistence is the maintenance of a state once it is established. An object's state (for example, window size, cursor location, scroll position, and so on) should always be automatically preserved when the user changes it.

- **Properties or Attributes of Objects**

Properties help to describe an object and can be changed by users. Examples of properties are text styles (such as normal or italics), font sizes (such as 10 or 12 points), or window background colors (such as black or blue).

- **Actions**

Commands are actions that manipulate objects. They may be performed in a variety of ways, including by direct manipulation or through a command button. They are executed immediately when selected. Once executed, they cease to be relevant. Examples of commands are opening a document, printing a document, closing a window, and quitting an application.

Property/attribute specification actions establish or modify the attributes or properties of objects. When selected, they remain in effect until deselected. Examples include selecting cascaded windows to be displayed, a particular font style, or a particular color.The following is a typical *property/attribute specification sequence:*

1. The user selects an object—for example, several words of text.
2. The user then selects an action to apply to that object, such as the action BOLD.
3. The selected words are made bold and will remain bold until selected and changed

	again. A series of actions may be performed on a selected object. Performing a series of actions on an object also permits and encourages system learning through exploration. ● **Application versus Object or Data Orientation** An application-oriented approach takes an action:object approach, like this: Action> 1. An application is opened (for example, word processing). Object> 2. A file or other object selected (for example, a memo). An object-oriented object:action approach does this: Object> 1. An object is chosen (a memo). Action> 2. An application is selected (word processing). ● **Views** Views are ways of looking at an object's information. IBM's SAA CUA describes four kinds of views: composed, contents, settings, and help. ***Composed*** views present information and the objects contained within an object. They are typically associated with data objects and are specific to tasks and products being worked with. ***Contents*** views list the components of objects. ***Settings*** views permit seeing and changing object properties. ***Help*** views provide all the help functions. **6. Use of recognition memory:** Continuous visibility of objects and actions encourages use of a person's more powerful recognition memory. The "out of sight, out of mind" problem is eliminated. **7. Concurrent performance of functions:** Graphic systems may do two or more things at one time. Multiple programs may run simultaneously. When a system is not busy on a primary task, it may process background tasks (cooperative multitasking). When applications are running as truly separate tasks, the system may divide the processing power into time slices and allocate portions to each application (preemptive multitasking). Data may also be transferred between programs. It may be temporarily stored on a "clipboard" for later transfer or be automatically swapped between programs.
7.(a)	Explain the five commandments in designing for people **Designing for People: The Five Commandments** The complexity of a graphical or Web interface will always magnify any problems that do occur. While obstacles to design will always exist, pitfalls can be eliminated if the following design commandments remain foremost in the designer's mind. 1. **Gain a complete understanding of users and their tasks.** The users are the customers. Today, people expect a level of design sophistication from all interfaces, including Web sites. The product, system or Web site must be geared to people's needs, not those of the developers. A wide gap in technical abilities, goals, and attitudes often exists between users and developers. A failure to understand the differences will doom a product or system to failure. 2. **Solicit early and ongoing user involvement.** Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs. Involvement also allows the developer to confront a person's resistance to change, a common human trait. People dislike change for a variety of reasons, among them fear of the unknown and lack of identification with the sys- tem. Involvement in design removes the unknown and gives the user a stake in the system or identification with it. One caution, however: user involvement should be based on job or task knowledge, not status or position. The boss seldom

	knows what is really happening out in the office. 3. **Perform rapid prototyping and testing.** Prototyping and testing the product will quickly identify problems and allow you to develop solutions. The design process is complex and human behavior is still not well understood. While the design guidelines that follow go a long way toward achieving ease of use, all problems cannot possibly be predicted. Prototyping and testing must be continually performed during all stages of development to uncover all potential defects. If thorough testing is not performed before product release, the testing will occur in the user's office. Encountering a series of problems early in system use will create a negative first impression in the customer's mind, and this may harden quickly, creating attitudes that may be difficult to change. It is also much harder and more costly to fix a product after its release. In many instances, people may adapt to, or become dependent upon, a design, even if it is inefficient. This also makes future modifications much more difficult. 4. **Modify and iterate the design as much as necessary.** While design will proceed through a series of stages, problems detected in one stage may force the developer to revisit a previous stage. This is normal and should be expected. Establish user performance and acceptance criteria and continue testing and modifying until all design goals are met. 5. **Integrate the design of *all* the system components.** The software, the documentation, the help function, and training needs are all important elements of a graphical system or Web site and all should be developed concurrently. A system is being constructed, not simply software. Concurrent development of all pieces will point out possible problems earlier in the design process, allowing them to be more effectively addressed. Time will also exist for design trade-offs to be thought out more carefully.
7.(b)	'Humans are complex organisms ' With a variety of attributes that have an important influence on interface and screen design. Justify and explain **Perception** Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth. Perception is influenced, in part, by *experience*. We classify stimuli based on models stored in our memories and in this way achieve understanding. In essence, we tend to match objects or sensations perceived to things we already know. Comparing the accumulated knowledge of the child with that of an adult in interpreting the world is a vivid example of the role of experience in perception. Other perceptual characteristics include the following: **Proximity**. Our eyes and mind see objects as belonging together if they are near each other in space. **Similarity**. Our eyes and mind see objects as belonging together if they share a common visual property, such as color, size, shape, brightness, or orientation. **Matching patterns.** We respond similarly to the same shape in different sizes. The letters of the alphabet, for example, possess the same meaning, regardless of physical size. **Succinctness.** We see an object as having some perfect or simple shape because perfection or simplicity is easier to remember. **Closure.** Our perception is synthetic; it establishes meaningful wholes. If something does not quite close itself, such as a circle, square, triangle, or word, we see it as closed anyway. **Unity.** Objects that form closed shapes are perceived as a group. **Continuity**. Shortened lines may be automatically extended.

	Balance. We desire stabilization or equilibrium in our viewing environment. Vertical, horizontal, and right angles are the most visually satisfying and easiest to look at. **Expectancies.** Perception is also influenced by expectancies; sometimes we perceive not what is there but what we expect to be there. Missing a spelling mistake in proofreading something we write is often an example of a perceptual expectancy error; we see not how a word *is* spelled, but how we *expect* to see it spelled. **Context.** Context, environment, and surroundings also influence individual perception. For example, two drawn lines of the same length may look the same length or different lengths, depending on the angle of adjacent lines or what other people have said about the size of the lines. **Signals versus noise.** Our sensing mechanisms are bombarded by many stimuli, some of which are important and some of which are not. Important stimuli are called signals; those that are not important or unwanted are called noise. Signals are more quickly comprehended if they are easily distinguishable from noise in our sensory environment. Noise interferes with the perception of signals to the extent that they are similar to one another. Noise can even mask a critical signal. For example, imagine a hidden word puzzle where meaningful words are buried in a large block matrix of alphabetic characters. The signals, alphabetic characters constituting meaningful words, are masked by the matrix of meaningless letters. The elements of a screen assume the quality of signal or noise, depending on the actions and thought processes of the user. Once a screen is first presented and has to be identified as being the correct one, the screen's title may be the signal, the other elements it contains simply being noise. When the screen is being used, the data it contains becomes the signal, and the title now reverts to noise. Other elements of the screen rise and fall in importance, assuming the roles of either signals or noise, depending on the user's needs of the moment. The goal in design is to allow screen elements to easily assume the quality of signal or noise, as the needs and tasks of the user change from moment to moment. The goal in design, then, is to utilize our perceptual capabilities so a screen can be structured in the most meaningful and obvious way.
8	Discuss with suitable examples the human characteristics on design 1. **Perception** 2. **Memory** 3. **Sensory Storage** 4. **Visual Acuity** 5. **Foveal and Peripheral Vision** 6. **Information Processing** 7. **Mental Models** 8. **Movement Control9. Learning** 10. **Skill** 11. **Individual Differences** 1. **Perception** Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth. Other perceptual characteristics include the following: a. **Proximity**. Our eyes and mind see objects as belonging together if they are near each other in space. b. **Similarity**. Our eyes and mind see objects as belonging together if they share a common visual property, such as color, size, shape, brightness, or orientation. c. **Matching patterns.** We respond similarly to the same shape in different sizes. The letters of the alphabet, for example, possess the same meaning, regardless of physical size. d. **Succinctness.** We see an object as having some perfect or simple shape because perfection or simplicity is easier to remember. e. **Closure.** Our perception is synthetic; it establishes meaningful wholes. If something does not quite close itself, such as a circle, square, triangle, or word, we see it as closed anyway.

f. **Unity**. Objects that form closed shapes are perceived as a group.

g. **Continuity**. Shortened lines may be automatically extended.

h. **Balance.** We desire stabilization or equilibrium in our viewing environment. Vertical, horizontal, and right angles are the most visually satisfying and easiest to look at.

i. **Expectancies.** Perception is also influenced by expectancies; sometimes we perceive not what is there but what we expect to be there. Missing a spelling mistake in proof reading something we write is often an example of a perceptual expectancy error; we see not how a word *is* spelled, but how we *expect* to see it spelled.

j. **Context.** Context, environment, and surroundings also influence individual perception. For example, two drawn lines of the same length may look the same length or different lengths, depending on the angle of adjacent lines or what other people have said about the size of the lines.

k. **Signals versus noise.** Our sensing mechanisms are bombarded by many stimuli, some of which are important and some of which are not. Important stimuli are called signals; those that are not important or unwanted are called noise. Signals are more quickly comprehended if they are easily distinguishable from noise in our sensory environment. Noise interferes with the perception of signals to the extent that they are similar to one another. Noise can even mask a critical signal. For example, imagine a hidden word puzzle where meaningful words are buried in a large block matrix of alphabetic characters. The signals, alphabetic characters constituting meaningful words, are masked by the matrix of meaningless letters.

2. Memory

Memory is not the most stable of human attributes, as anyone who has forgotten why they walked into a room, or forgotten a very important birthday, can attest. Memory is viewed as consisting of two components,

1. long-term memory
2. short-term (or working) memory

Short-term, or working, memory receives information from either the senses or long term memory, but usually cannot receive both at once, the senses being processed separately. Within short-term memory a limited amount of information processing takes place. Information stored within it is variously thought to last from 10 to 30 seconds, with the lower number being the most reasonable speculation. *Long-term* memory contains the knowledge we possess. Information received in short-term memory is transferred to it and encoded within it, a process we call learning. It is a complex process requiring some effort on our part. The learning process is improved if the information being transferred from short-term memory has structure and is meaningful and familiar. Learning is also improved through repetition.

Minimize the need for a mighty memory.

Other general ways to reduce user memory loads, reduce the need for mental integration, and expand working memory, thus enhancing system usability include:

- Presenting information in an organized, structured, familiar, and meaningful way.
- Placing all required information for task performance in close physical proximity.
- Giving the user control over the pace of information presentation.

3. Sensory Storage

Sensory storage is the buffer where the automatic processing of information collected from our senses takes place. It is an unconscious process, large, attentive to the environment, quick to detect changes, and constantly being replaced by newly gathered stimuli. It acts like radar, constantly scanning the environment for things that are important to pass on to higher memory.

One good example is what is sometimes called the ―cocktail party affect.‖ Have you ever been at a party when, across the room, through the din of voices, someone mentions your name, and you hear it? In spite of the noise, your radar was functioning.

	4. Visual Acuity The capacity of the eye to resolve details is called *visual acuity*. It is the phenomenon that results in an object becoming more distinct as we turn our eyes toward it and rapidly losing distinctness as we turn our eyes away—that is, as the visual angle from the point of fixation increases. **5. Foveal and Peripheral Vision** *Foveal vision* is used to focus directly on something; *peripheral vision* senses anything in the area surrounding the location we are looking at, but what is there cannot be clearly resolved because of the limitations in visual acuity just described. Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship. Peripheral vision can aid a visual search, but can also be distracting. **6. Information Processing** The information that our senses collect that is deemed important enough to do something about then has to be processed in some meaningful way. Recent thinking (Lind, Johnson, and Sandblad, 1992) is that there are two levels of information processing going on within us. One level, the highest level, is identified with consciousness and working memory. It is limited, slow, and sequential, and is used for reading and understanding. You are utilizing this higher level now reading this book. In addition to this higher level, there exists a lower level of information processing, an the limit of its capacity is unknown. This lower level processes familiar information rapidly, in parallel with the higher level, and without conscious effort. We look rather than see, perceive rather than read. Repetition and learning results in a shift of control from the higher level to the lower level. Both levels function simultaneously, the higher level performing reasoning and problem solving, the lower level perceiving the physical form of information sensed. **7. Mental Models** A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental mode and most often is unaware it even exists. Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person. Mental models also enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered. A person already familiar with one computer system will bring to another system a mental model containing specific visual and usage expectations. **8. Movement Control** Once data has been perceived and an appropriate action decided upon, a response must be made; in many cases the response is a movement. In computer systems, movements include such activities as pressing keyboard keys, moving the screen pointer by pushing a mouse or rotating a trackball, or clicking a mouse button. Particularly important in screen design is Fitts' Law (1954). This law states that: The time to acquire a target is a function of the distance to and size of the target. This simply means that the bigger the target is, or the closer the target is, the faster it will be reached. The implications in screen design are: Provide large objects for important functions. Take advantage of the ―pinning‖ actions of the sides, top, bottom, and corners of the screen. **9. Learning** Learning, as has been said, is the process of encoding in long-term memory information that is contained in short-term memory. It is a complex process requiring some effort on our part. Our ability to learn is important—it clearly differentiates people from machines. A design developed to minimize human learning time can greatly accelerate human performance. People prefer to stick with what they know, and they prefer to jump in and get

started. Unproductive time spent learning is something frequently avoided.

- Learning can be enhanced if it:

Allows skills acquired in one situation to be used in another somewhat like it. Design consistency accomplishes this.

- Provides complete and prompt feedback.
- Is phased, that is, it requires a person to know only the information needed at that stage of the learning process.

10. **Skill**

The goal of human performance is to perform skillfully. To do so requires linking inputs and responses into a sequence of action. The essence of skill is performance of actions or movements in the correct time sequence with adequate precision. It is characterized by consistency and economy of effort. Economy of effort is achieved by establishing a work pace that represents optimum efficiency. It is accomplished by increasing mastery of the system through such things as progressive learning of shortcuts, increased speed, and easier access to information or data. Skills are hierarchical in nature, and many basic skills may be integrated to form increasingly complex ones. Lower-order skills tend to become routine and may drop out of consciousness. System and screen design must permit development of increasingly skillful performance.

11. **Individual Differences**

In reality, there is no average user. A complicating but very advantageous human characteristic is that we all differ—in looks, feelings, motor abilities, intellectual abilities, learning abilities and speed, and so on. In a keyboard data entry task, for example, the best typists will probably be twice as fast as the poorest and make 10 times fewer errors. Individual differences complicate design because the design must permit people with widely varying characteristics to satisfactorily and comfortably learn the task or job, or use the Web site. In the past this has usually resulted in bringing designs down to the level of lowest abilities or selecting people with the minimum skills necessary to performa job. But technology now offers the possibility of tailoring jobs to the specific needs of people with varying and changing learning or skill levels. Multiple versions of a system can easily be created. Design must provide for the needs of all potential users.