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Human Computer Interface

By

Anjana Gautam

Human Computer Interface (CS/IT : Sem-5 & 7)
1st Edition : *2019-20*
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Human Computer Interface (KCS- 058)	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**

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CO 1	Understand and analyze the common methods in the user-centered design process and the appropriateness of individual methods for a given problem.	K_2, K_4
CO 2	Apply , adapt and extend classic design standards, guidelines, and patterns.	K_3, K_5
CO 3	Employ selected design methods and evaluation methods at a basic level of competence.	K_4, K_5
CO 4	Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.	K_4, K_5
CO 5	Demonstrate sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.	K_3, K_4

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Importance of user Interface – definition, importance of 8 good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**08**
II	**Design process:** Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions. III Screen Designing : Design goals – Scre	**08**
III	**Screen Designing :** Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**08**
IV	**Windows :** New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**08**
V	**Software tools :** Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	**08**

Text books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.

2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

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UNIT

Introduction

CONTENTS

PART-1

Introduction : Importance of user Interface-Definition.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.1. **What do you mean by user interface ? Define user interface design. Why user interface is important ?**

Answer

1. The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct.
2. User interface design is a subset of a field of study called human-computer interaction.
3. 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.
4. The user interface has essentially two components :
   i. **Input :** Input is how a person communicates his/her needs to the computer. Some common input components are the keyboard, mouse, trackball.
   ii. **Output :** Output is how the computer conveys the results of its computations and requirements to the user. The most common computer output mechanism is the display screen, followed by mechanisms that take advantage of a person's auditory capabilities such as voice and sound.
5. Proper interface design will provide a mix of well-designed input and output mechanisms that satisfy the user's needs, capabilities, and limitations in the most effective way possible.
6. User interface is important because it makes it easier for target audience to clearly see the information about particular products.

PART-2

Importance of Good Design, Benefits of Good Design A Brief History of Screen Design.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.2. | **Describe the importance of good design.**

Answer

Important of good design :

1. A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system.

2. It is also the vehicle through which many critical tasks are presented.

3. These tasks often have a direct impact on an organization's relations with its customers, and its profitability.

4. A screen's layout and appearance affect a person in a variety of ways :

   a. If they are confusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes.

   b. Poor design may even chase some people away from a system permanently.

   c. It can also lead to aggravation, frustration, and increased stress.

Que 1.3. | **What are the benefits of good design ?**

Answer

The benefits of good design :

1. Screens users of the modified screens completed transactions in less time and with fewer errors than those who used the original screens.

2. Reformatting inquiry screens following good design principles reduced decision-making time.

3. Redesigns eventually improved the success rate, and reduced the average completion time.

4. The more successful, and more usable, site task completion rate is about 65 percent higher than that of the less successful sites.

5. Training costs are lowered because training time is reduced.

6. Support line costs are lowered because fewer assist calls are necessary.

7. Employee satisfaction is increased because aggravation and frustration are reduced.

Que 1.4. | **Write a short note on history of screen design.**

Answer

1. The widespread interest in the application of good design principles to screens did not begin to emerge until the early 1970s, when IBM introduced its 3270 cathode ray tube text-based terminal.

2. A 1970s screen usually consisted of many fields with very cryptic and often unintelligible captions.

3. It was visually cluttered, and often possessed a command field that challenged the user to remember what had to be keyed into it.

4. In 1980-1981 (Galitz), at the turn of the decade guidelines for text-based screen design were finally made widely available and many screens began to take on a much less cluttered look through concepts such as grouping and alignment of element.

5. User memory was supported by providing clear and meaningful field captions and by listing commands on the screen, and enabling them to be applied through function keys.

6. Messages also became clearer. These screens were not entirely clutter-free, however. Instructions and reminders to the user had to be inscribed on the screen in the form of prompts or completion aids.

7. In the 1980s, 1970s-type screens were still being designed, and many still reside in systems today.

8. The entry field was supplemented by a multitude of other kinds of controls, including list boxes, drop-down combination boxes, spin boxes, and so forth.

9. In the 1990s, knowledge concerning what makes effective screen design continued to expand. Coupled with ever-improving technology, the result was even greater improvements in the user-computer screen interface.

PART-3

The Graphical User Interface : Popularity of Graphics, The Concept of Direct Manipulation.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.5. | **What do you mean by graphical user interface ?**

Answer

1. A user interface is a collection of techniques and mechanism to interact with something.

2. In a graphical interface, the primary interaction mechanism is a pointing device of some kind. This device is the electronic equivalent to the human hand.

3. The user interacts with is a collection of elements referred to as objects. They can be seen, heard, touched, or otherwise perceived.

4. Objects are always visible to the user and are used to perform tasks.

5. They are interacted with as entities independent of all other objects.

6. People perform operations, called actions, on objects.

7. The operations include accessing and modifying objects by pointing, selecting, and manipulating.

8. All objects have standard resulting behaviors.

Que 1.6. | **What is popularity of graphics ?**

Answer

1. A graphical screen bore scant resemblance to its earlier text-based colleagues.

2. Whereas the older text-based screen possessed a one dimensional graphic screens assumed a three-dimensional look.

3. Controls appeared to rise above the screen and move when activated.

4. Information could appear, and disappear, as needed.

5. Text could be replaced by graphical images called icons. These icons could represent objects or actions.

6. Selection fields such as radio buttons, check boxes, list boxes, and palettes coexisted with the reliable old text entry field.

7. Objects and actions were selected through use of pointing mechanisms.

8. Increased computer power enables the user's actions to be reacted to quickly, dynamically, and meaningfully.

9. This interface is sometimes referred as WIMP interface: windows, icons, menus, and pointers.

10. Graphic presentation is much more effective than other presentation methods.

11. Properly used, it reduces the requirement for perceptual and mental information recoding and reorganization, and also reduces the memory loads.

12. Graphics also can add appeal or charm to the inter-face and permit greater customization to create a unique corporate or organization style.

Que 1.7. | **Describe the concept of direct manipulation.**

Answer

The style of interaction for graphical systems is called as direct manipulation systems that possess the following characteristics :

1. The system is portrayed as an extension of the real world :

   i. It is assumed that a person is already familiar with the objects and actions in his or her environment of interest.

ii. The system simply replicates them and portrays them on a different medium, the screen.

iii. A person has the power to access and modify these objects, among which are windows.

iv. A person is allowed to work in a familiar environment and in a familiar way, focusing on the data, not the application and tools.

v. The physical organization of the system, which most often is unfamiliar, is hidden from view and is not a distraction.

2. Continuous visibility of objects and actions :

i. Like one's desktop, objects are continuously visible.

ii. Reminders of actions to be performed are also obvious, labeled buttons replacing complex syntax and command names.

iii. Cursor action and motion occurs in physically obvious and natural ways.

3. Actions are rapid and incremental with visible display of results :

i. The results of actions are immediately displayed visually on the screen in their new and current form.

ii. Auditory feedback may also be provided.

iii. The impact of a previous action is quickly seen, and the evolution of tasks is continuous and effortless.

4. Incremental actions are easily reversible :

i. Finally, actions, if discovered to be incorrect or not desired, can be easily undone.

PART-4

Graphical System, Characteristics.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.8. **What is graphical system ? Write down its advantages and disadvantages.**

Answer

Graphical system design is an approach to designing an entire system, using more intuitive graphical software and off-the-shelf hardware device to refine the design, create initial prototypes and even use for the few run of deployments.

Advantages graphical systems :

1. **Symbols recognized faster than text :** Research has found that symbols can be recognized faster and more accurately than text, and that the graphical attributes of icons, such as shape and color, are very useful for quickly classifying objects, elements, or text by some common property.

2. **Faster learning :** Research has also found that a graphical, pictorial representation aids learning, and symbols can also be easily learned.

3. **Faster use and problem solving :** Visual or spatial representation of information has been found to be easier to retain and manipulate and leads to faster and more successful problem solving. Symbols have also been found to be effective in conveying simple instructions.

4. **Easier remembering :** Because of greater simplicity, it is easier for casual users to retain operational concepts.

5. **Provides context :** Displayed objects are visible, providing a picture of the current context.

6. **Fewer errors :** More concrete thinking affords fewer opportunities for errors. Reversibility of actions reduces error rates because it is always possible to undo the last step. Error messages are less frequently needed.

7. **Increased feeling of control :** The user initiates actions and feels in control. This increases user confidence and hastens system mastery.

8. **Immediate feedback :** The results of actions furthering user goals can be seen immediately. Learning is quickened. If the response is not in the desired direction, the direction can be changed quickly.

Disadvantages of graphical systems :

1. **Inconsistencies in technique and terminology :** Many differences in technique, terminology, look and feel exist among various graphical system providers, and even among successive versions of the same system. These inconsistencies occur because of copyright and legal implications, product differentiation considerations, and our expanding knowledge about the interface.

2. **Working domain is the present :** While direct-manipulation systems provide context, they also require the user to work in the "present."

3. **Not always familiar :** Symbolic representations may not be as familiar as words or numbers. We have been exposed to words and numbers for a long time.

4. **Window manipulation requirements :** Window handling and manipulation times are still excessive and repetitive. This wastes time and interrupts the decision making needed to perform tasks and jobs.

5. **Production limitations :** The number of symbols that can be clearly produced using today's technology is still limited. A body of recognizable symbols must be produced that are equally legible and equally recognizable using differing technologies. This is extremely difficult today.

Que 1.9. | **Describe the characteristics of graphical system.**

Answer

Characteristics of graphical system :

1. Sophisticated visual presentation :

   i. Visual presentation is the visual aspect of the interface. It is what people see on the screen.

   ii. The sophistication of a graphical system permits displaying lines, including drawings and icons.

   iii. It also permits the displaying of a variety of character fonts, including different sizes and styles.

   iv. The display of 16 million or more colors is possible on some screens.

   v. Graphics also permit animation and the presentation of photograph and motion video.

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

   a. Windows (primary, secondary, or dialog boxes)

   b. Menus (menu bar, pull down, pop-up, cascading)

   c. Icons to represent objects such as programs or files

   d. Assorted screen-based controls (text boxes, list boxes, combination boxes, settings, scroll bar and buttons)

   e. Mouse pointer and cursor.

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

2. Restricted set of interface options :

   i. The array of alternatives available to the user is what is presented on the screen or may be retrieved through what is presented on the screen, nothing less, nothing more.

3. Pick-and-click interaction :

   i. Elements of a graphical screen upon which some action is to be performed must first identified.

   ii. The motor activity required of a person to identify this element for a proposed action is commonly referred to as pick, the signal to perform an action as cue.

   iii. The primary mechanism for performing this pick-and-click is most often the mouse and its buttons.

   iv. The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).

   v. Pointing allows rapid selection and feedback. The hand and mind seem to work smoothly and efficiently together.

    vi. 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.

4. Visualization :

    i. Visualization is a cognitive process that allows people to understand information that is difficult to perceive.

    ii. Presenting specialized graphic portrayals facilitates visualization.

    iii. The best visualization method for an activity depends on what people are trying to learn from the data.

    iv. The goal is not necessarily to reproduce a realistic graphical image, but to produce one that conveys the most relevant information.

    v. Effective visualizations can facilitate mental insights, increase productivity, and more accurate use of data.

5. Object orientation :

    i. A graphical system consists of objects and actions.

    ii. Objects are what people see on screen. They are manipulated as a single unit.

    iii. Objects can be composed of sub objects. For example, an object may be a document. The document's sub objects may be a paragraph, sentence, word, and letter.

6. Use of recognition memory :

    i. Continuous visibility of objects and actions encourages use of a person's more powerful recognition memory.

    ii. The "out of sight, out of mind" problem is eliminated

7. Concurrent performance of functions :

    i. 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).

    ii. When applications are running as truly separate tasks, the system may divide the processing power into time slices and allocate portions to each application.

    iii. Data may also be transferred between programs. It may be temporarily stored on a "clipboard" for later transfer or be automatically swapped between programs.

Que 1.10. **Describe the characteristics of intranet versus the internet.**

Answer

Characteristics of an intranet versus the internet :

1. Users :

i.   The users of intranets, being organization employees, know a lot about the organization, its structure, its products, and its culture.

ii. Internet sites are used by customers and others who know much less about the organization, and often care less about it.

iii. The intranet user's characteristics and needs can be much more specifically defined then can those of the general Internet user.

2. Tasks :

i.   An intranet is used for an organization's everyday activities, including complex transactions, queries, and communications.

ii. The internet is mainly used to find information, with a supplementary use being simple transactions.

3. Type of information :

i.   An intranet will contain detailed information needed for organizational functioning.

ii. Information will often be added or modified.

iii. The internet will usually present more stable information such as marketing and customer or client information, reports.

4. Amount of information :

i.   Typically, an intranet site will be much larger than an organization's Internet site.

ii. Massive amounts of information and processes seem to be needed to make an organization function.

iii. It has been estimated that an intranet site can be ten to one hundred times larger than its corresponding public site.

5. Hardware and software :

i.   Since intranets exist in a controlled environment, the kinds of computers, monitors, browsers, and other software can be restricted or standardized.

ii. The need for cross-platform compatibility is minimized or eliminated, permitting more predictable design.

iii. Upgraded communications also permit intranets to run from a hundred to a thousand times faster than typical internet access can.

iv. This allows the use of rich graphics and multimedia, screen elements that contribute to very slow download times for most internet users.

6. Design philosophy :

i.   Implementation on the intranet of current text-based and GUI applications will present a user model similar to those that have existed in other domains.

ii. This will cause a swing back to more traditional GUI designs that will also incorporate the visual appeal of the Web, but eliminate many of its useless, promotional, and distracting features.

iii. The resulting GUI hybrids will be richer and much more effective.

Que 1.11. **What are the usability problems in graphical system ?**

Answer

Usability problems in graphical system :

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.

PART-5

Web User Interface, Popularity, Characteristics, Principles of User Interface.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.12. **Explain web user interface.**

Answer

1. Web interface design is the design of navigation and the presentation of information. It is about content, not data.
2. Proper interface design is largely a matter of properly balancing the structure and relationships of menus, content, and other linked documents or graphics.
3. The design goal is to build a hierarchy of menus and pages that feels natural, is well structured, is easy to use, and is truthful.

4.   The web is a navigation environment where people move between pages of information, not an application environment.

5.   It is also a graphically rich environment.

Que 1.13. | **Discuss the popularity of web interface.**

Answer

1.   While the introduction of the graphical user interface revolutionized the user interface, the web has revolutionized computing.

2.   It allows millions of people scattered across the globe to communicate, access information, publish, and be heard.

3.   It allows people to control much of the display and the rendering of Web pages.

4.   Aspects such as typography and colors can be changed, graphics turned off, and decisions made whether or not to transmit certain data over non-secure channels or whether to accept or refuse cookies.

5.   Nowhere in the history of computing has the user been given so much control.

6.   Web usage has reflected this popularity. The number of Internet hosts has risen dramatically.

7.   In 1984, hosts online exceeded 1,000; in 1987, 10,000; in 1989, 100,000, in 1990, 300,000; in 1992 hosts exceeded one million.

8.   Commercialization of the Internet saw even greater expansion of the growth rate.

9.   In 1993, Internet traffic was expanding at a 341,634 percent annual growth rate. In 1996, there were nearly 10 million hosts online and 40 million connected people.

Que 1.14. | **What are the characteristics of web user interface ?**

Answer

Characteristics of a web interface :

A web interface possesses a number of characteristics, some of which are similar to a GUI interface and some are different.

1. GUI versus web page design : GUI and web interface design do have similarities :

a.   Both are software designs, they are used by people, they are interactive, they are heavily visual experiences presented through screens, and they are composed of many similar components.

b.   The following paragraphs highlight the other most significant differences.

i. Devices :

a. In GUI design, the characteristics of interface devices such as monitors and modems are well defined, and design variations tend to be restricted.

b. Monitor display capabilities, such as installed fonts and screen size, are established and easily considered in the design process.

c. In web design, no assumptions about the user's interface devices can be made.

d. User devices may range from handheld mechanisms to high-end workstations.

ii. User focus :

a. GUI systems are about well-defined applications and data, about transactions and processes.

b. Thorough attention must usually be addressed to tasks in need of completion.

c. The web is about information and navigation, an environment where people move back and forth in an unstructured way among many pages of information.

d. Web use is most often characterized browsing and visual scanning of information to find what information is needed.

iii. Data / Information :

a. GUI data is typically created and used by known and trusted.

b. Sources, people in the user's organization or reputable and reliable companies and organizations.

c. The properties of the system's data are generally known, and the information is typically organized in an understandable and meaningful fashion.

d. The web is full of unknown content typically placed there by others unknown to the user.

e. Typical users don't put information on the web (except for publishing their own pages).

f. The reliability and truthfulness of found information cannot always be ascertained and trusted.

g. Web content is usually highly variable in organization, and the privacy of the information is often suspect.

2. Printed pages versus web pages :

a. Research and experience with printed pages through these centuries has created a fundamental and accepted set of guidelines for editorial style, element presentation, and text organization.

b. Many of the basic guidelines, clear, comprehensive, and consistent, can and are being applied to Web page design.

c. Web page design, however, is different in many aspects from the design of books, documents, newspapers, and other similar materials.

d. The major differences between print and web page design are briefly described as follows :

i. Page size :

a. Printed pages are generally larger than their web counterparts.

b. They are also fixed in size, not variable like web pages.

c. 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.

d. 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.

ii. Page layout :

a. With the printed page, layout is precise with much attention given to it.

b. With web pages layout is more of an approximation, being negatively influence by deficiencies in design toolkits and the characteristics of the user's browser and hardware, particularly screen sizes.

iii. Page resolution :

a. Today, the resolution of displayed print characters still exceeds that of screen characters, and screen reading is still slower than reading from a document.

b. The ultimate goal : a screen resolution sharp enough to render type crisply enough so that screen reading speed reaches that of newspaper reading.

Que 1.15. | **Describe the principles of user interface.**

Answer

Principles of user interface design :

1. An interface must really be just an extension of a person.

2. This means that the system and its software must reflect a person's capabilities and respond to his or her specific needs.

3. It should be useful, accomplishing some business objectives faster and more efficiently than the previously used method.

4. The system must be easy and fun to use, evoking a sense of pleasure and accomplishment not tedium and frustration.

5. The interface itself should serve as both a connector and a separator : a connector in that it ties the user to the power of the computer, and a

separator in that it minimizes the possibility of the participants damaging one another.

6. While the damage the user inflicts on the computer tends to be physical (a frustrated pounding of the keyboard), the damage caused by the computer is more psychological (a threat to one's self-esteem).

Que 1.16. **Describe the principles established the foundation for graphical interfaces.**

Answer

Principles established the foundation for graphical interfaces :

1. The illusion of manipulable objects :

a. Displayed objects that are selectable and manipulable must be created.

b. A design challenge is to invent a set of displayable objects that are represented meaningfully and appropriately for the intended application.

c. It must be clear that these objects can be selected, and how to select them must be self-evident.

d. Standalone icons easily fulfilled this requirement. The handles for windows were placed in the borders.

2. Visual order and viewer focus :

a. Attention must be drawn, at the proper time, to the important and relevant elements of the display.

b. Effective visual contrast between various components of the screen is used to achieve the goal.

c. Animation is also used to draw attention, as is sound.

d. Feedback must also be provided to the user. Since the pointer is usually the focus of viewer attention, it is a useful mechanism for providing this feedback (by changing shapes).

3. Revealed structure :

a. The distance between one's intention and the effect must be minimized.

b. Most often, the distance between intention and effect is lengthened as system power increases.

c. The relationship between intention and effect must be tightened and made as apparent as possible to the user.

4. Consistency : Consistency aids learning. Consistency is provided in such areas as element location, grammar, font shapes, styles, and sizes, selection indicators, and contrast and emphasis techniques.

5. Appropriate effect or emotional impact :

a. The interface must provide the appropriate emotional effect for the product and its market.

b. Is it a corporate, professional, and secure business system? Should it reflect the fantasy, wizardry, and bad puns of computer games?

6. A match with the medium :

a. The interface must also reflect the capabilities of the device on which it will be displayed.

b. Quality of screen images will be greatly affected by a device's resolution and color-generation capabilities.

Que 1.17. | **Describe the design goals in creating user interface.**

Answer

Design goals in creating a user interface are :

1. Aesthetically pleasing :

i. Provide meaningful contrast between screen elements.

ii. Create groupings.

iii. Align screen elements and groups.

iv. Provide three-dimensional representation.

v. Use color and graphics effectively and simply.

2. Compatibility :

i. Provide compatibility with the following :

    a. User compatibility : Design must be appropriate and compatible with the needs of the user or client. Effective design starts with understanding the user's needs and adopting the user's point of view.

    b. Task and job compatibility : The organization of a system should match the tasks a person must do to perform the job. The structure and flow of functions should permit easy transition between tasks.

    c. Product compatibility : The intended user of a new system is often the user of other systems or earlier versions of the new system. Habits, expectations, and a level of knowledge have been established and will be brought to bear when learning the new system.

3. Comprehensibility :

i. A system should be understandable, flowing in a comprehensible and meaningful order.

ii. Strong clues to the operation of objects should be presented.

iii. The steps to complete a task should be obvious. Reading and digesting long explanations should never be necessary.

4.   Consistency : A system should look, act, and operate the same throughout. Similar components should :

    i.   The same action should always yield the same result.

    ii.   The function of elements should not change.

    iii. The position of standard elements should not change.

Que 1.18. | **Why web user interface design difficult ?**

Answer

1.   Web interface design is also more difficult because the main issues concern information architecture and task flow, neither of which is easy to standardize.

2.   It is more difficult because of the availability of the various types of multimedia, and the desire of many designers to use something simply because it is available.

3.   It is more difficult because users are ill defined, and the user's tools so variable in nature.

4.   Today, then, the Web interface is a victim of its poor foundation. It is also a victim of its explosive and haphazard growth.

5.   Looking forward, interface design tools will mature, research-based design guidelines will become increasingly available (and will be applied), and knowledge of users and their needs will expand.

6.   Then, the ultimate goal of a Web that feels natural, is well structured, and is easy to use will reach fruition.

Que 1.19. | **Explain the five commandments for designing user interface.**

Answer

Five commandments for designing user interface :

1.   Gain a complete understanding of users and their tasks :

    i.   The users are the customers.

    ii.   Today, people expect a level of design sophistication from all interfaces, including Web sites.

    iii. The product, system or Web site must be geared to people's needs, not those of the developers.

2.   Solicit early and ongoing user involvement :

    i.   Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs.

    ii.   Involvement also allows the developer to confront a person's resistance to change, a common human trait.

3. Perform rapid prototyping and testing :

    i.   Prototyping and testing the product will quickly identify problems and allow us to develop solutions.

    ii.   The design process is complex and human behavior is still not well understood.

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.

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.

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2
UNIT

Design Process

CONTENTS

PART-1

Design Process : Human Interaction with Computers.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 2.1. | **Discuss human computer interaction.**

Answer

1. Human-computer interaction (HCI) is the study and planned design of human and computer activities.

2. HCI uses productivity, safety and entertainment to support and fulfill human-computer activities and is applied to various types of computer systems, including air traffic control, nuclear processing, offices and computer gaming.

3. HCI systems are easy, safe, effective and enjoyable.

4. The goals of HCI are to produce usable and safe systems, as well as functional systems. In order o produce computer systems with good usability, developers must attempt to :

    i.   Understand the factors that determine how people use technology.

    ii.   Develop tools and techniques to enable building suitable systems.

    iii. Achieve efficient, effective, and safe interaction.

    iv. Put people first.

Que 2.2. | **How a person interact with computer.**

Answer

When interacting with a computer, a person:

1. Identifies a task to be performed or need to be fulfilled :

    i.   The task may be very structured, including activities such as: enter this data from this form into the system, answer a specific question regarding the status of an order, or collect the necessary information from a customer to make a reservation.

2. Decides how the task will be completed or the need fulfilled :

    i.   For a structured or semi-structured task a set of transaction screens will be available.

    ii.   The proper transaction is identified and the relevant screen series retrieved.

    iii.   To satisfy a general or vague need will require browsing or searching through screens that might possibly have relevance.

3. Manipulates the computer's controls :

    i.   To perform the task or satisfy the need, the keyboard, mouse, and other similar devices are used to select choices from lists, choose commands to be performed, key data into text boxes, and so forth.

4. Gathers the necessary data :

    i.   Using structured and semi-structured transaction screens information is collected from its source: a form, a coworker, or a customer.

    ii.   This information is identified on the screen, or placed on the screen, through control manipulation.

5. Forms judgments resulting in decisions relevant to the task or need :

    i.   Structured transactions will require minimal decision-making.

    ii.   Has all the data been collected and is the data valid? Has the transaction been successfully accepted by the system? If not accepted, why not?

    iii.   Semi-structured transactions may require decisions such as: Which set of screens should be use to complete this process ?

Que 2.3. | **What are the factors that make system difficult to use ?**

Answer

Factors that make system difficult to use are :

1. Use of jargon :

    i.   Systems often speak in a strange language. Words that are completely alien to the office or home environment or used in different contexts, such as filespec, abend, segment, and boot, proliferate.

    ii.   Learning to use a system often requires learning a new language.

2. Non-obvious design :

    i.   Complex or novel design elements are not obvious or intuitive, but they must nevertheless be mastered.

    ii.   Operations may have prerequisite conditions that must be satisfied before they can be accomplished, or outcomes may not always be immediate, obvious, or visible.

    iii.   The overall framework of the system may be invisible, with the effect that results cannot always be related to the actions that accomplish them.

3. Fine distinctions :

i. Different actions may accomplish the same thing, depending upon when they are performed, or different things may result from the same action.

ii. Often these distinctions are minute and difficult to keep track of.

iii. Critical distinctions are not made at the appropriate time, or distinctions having no real consequence are made.

4. Design inconsistency :

i. The same action may have different names: for example, "save" and "keep," "write" and "list."

ii. The same command may cause different things to happen. The same result may be described differently: for example, "not legal" and "not valid." Or the same information may be ordered differently on different screens.

iii. The result is that system learning becomes an exercise in rote memorization. Meaningful or conceptual learning becomes very difficult.

Que 2.4. **What are the psychological responses to poor design ?**

Answer

Psychological responses to poor design :

1. Confusion :

i. Detail overwhelms the perceived structure.

ii. Meaningful patterns are difficult to ascertain, and the conceptual model or underlying framework cannot be understood or established.

2. Annoyance :

i. Roadblocks that prevent a task being completed, or a need from being satisfied, promptly and efficiently lead to annoyance.

ii. Inconsistencies in design, slow computer reaction times, difficulties in quickly finding information, outdated information, and visual screen distractions are a few of the many things that may annoy users.

3. Frustration :

i. An overabundance of annoyances, an inability to easily convey one's intentions to the computer, or an inability to finish a task or satisfy a need can cause frustration.

ii. Frustration is heightened if an unexpected computer response cannot be undone or if what really took place cannot be determined.

ii. Inflexible and unforgiving systems are a major source of frustration.

4.   Panic or stress :

i.   Unexpectedly long delays during times of severe or unusual pressure may introduce panic or stress.

ii.   Some typical causes are unavailable systems or long response times when the user is operating under a deadline or dealing with an irate customer.

5.   Boredom : Boredom results from improper computer pacing (slow response times or long download times) or overly simplistic jobs.

Que 2.5.   **What are the physical reactions to poor design ?**

Answer

Psychological responses frequently lead to, or are accompanied by, the following physical reactions :

1.   Abandonment of the system :

i.   The system is rejected and other information sources are relied upon.

ii.   These sources must, of course, be available and the user must have the discretion to perform the rejection.

iii. In business systems this is a common reaction of managerial and professional personnel.

iv.   With the web, almost all users can exercise this option.

2.   Partial use of the system :

i.   Only a portion of the system's capabilities are used, usually those operations that are easiest to perform or that provide the most benefits.

ii.   Historically, this has been the most common user reaction to most computer systems. Many aspects of many systems often go unused.

3.   Indirect use of the system :

i.   An intermediary is placed between the user and the computer.

ii.   Again, since this requires high status and discretion, it is another typical response of managers or others with authority.

4.   Modification of the task :

i.   The task is changed to match the capabilities of the system.

ii.   This is a prevalent reaction when the tools are rigid and the problem is unstructured, as in scientific problem solving.

5.   Compensatory activity :

i.   Additional actions are performed to compensate for system inadequacies.

ii.   A common example is the manual reformatting of information to match the structure required by the computer.

iii. This is a reaction common to workers whose discretion is limited, such as clerical personnel.

6. Misuse of the system :

i. The rules are bent to shortcut operational difficulties.

ii. This requires significant knowledge of the system and may affect system integrity.

7. Direct programming :

i. The system is reprogrammed by its user to meet specific needs.

ii. This is a typical response of the sophisticated worker.

PART-2

Importance of Human Characteristics, Human Consideration.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 2.6. Explain the important human characteristics.

Answer

Important human characteristics are :

1. Perception :

i. 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.

ii. 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.

2. Memory :

i. 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.

ii. Memory is viewed as consisting of two components, long-term and short-term (or working) memory.

iii. 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.

iv. Within short-term memory a limited amount of information processing takes place.

v. Information stored within it is variously thought to last from 10 to 30 seconds, with the lower number being the most reasonable speculation.

vi. Long-term memory contains the knowledge we possess.

vii. Information received in short-term memory is transferred to it and encoded within it, a process we call learning.

viii. It is a complex process requiring some effort on our part.

ix. The learning process is improved if the information being transferred from short-term memory has structure and is meaningful and familiar.

x. Learning is also improved through repetition.

xi. Unlike short-term memory, with its distinct limitations, long-term memory capacity is thought to be unlimited.

3. Sensory storage :

i. Sensory storage is the buffer where the automatic processing of information collected from our senses takes place.

ii. It is an unconscious process, large, attentive to the environment, quick to detect changes, and constantly being replaced by newly gathered things.

iii. In a sense, it acts like radar, constantly scanning the environment for things that are important to pass on to higher memory.

4. Visual acuity :

i. The capacity of the eye to resolve details is called visual acuity.

    ii.   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.

    iii.   If one assumes that the average viewing distance of a display screen is 19 inches (475 mm), the size of the area on the screen of optimum visual acuity is 1.67 inches (41.8 mm) in diameter.

5. Foveal vision and peripheral vision :

    i.   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.

    ii.   Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship.

    iii.   Peripheral vision can aid a visual search, but can also be distracting.

    iv.   In its cooperative nature, peripheral vision is thought to provide clues to where the eye should go next in the visual search of a screen.

    v.   Patterns, shapes, and alignments peripherally visible can guide the eye in a systematic way through a screen.

    vi.   In its competitive nature, peripheral vision can compete with foveal vision for attention.

Que 2.7. | **Describe the following term with respect to human characteristics in design :**

a. Information processing
b. Mental models
c. Learning
d. Skills
e. Individual differences

Answer

a. Information processing :

1. The information that our senses collect that is deemed important enough to do something about then has to be processed in some meaningful way.

2. Recent thinking is that there are two levels of information processing going on within us.

3. One level, the highest level, is identified with consciousness and working memory.

4. It is limited, slow, and sequential, and is used for reading and understanding.

5. In addition to this higher level, there exists a lower level of information processing, and the limit of its capacity is unknown.

6. This lower level processes familiar information rapidly, in parallel with the higher level, and without conscious effort.

7. We look rather than see, perceive rather than read.

8. Repetition and learning results in a shift of control from the higher level to the lower level.

9. Both levels function simultaneously, the higher level performing reasoning and problem solving, the lower level perceiving the physical form of information sensed.

b. Mental models :

1. A mental model is simply an internal representation of a person's current understanding of something.

2. Usually a person cannot describe this mental mode and most often is unaware it even exists.

3. Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person.

4. 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.

5. When confronting a new computer system, people will bring their own expectations and preconceptions based upon mental models they have formed doing things in their daily life.

6. If the system conforms to the mental models a person has developed, the model is reinforced and the system's use feels more "intuitive."

7. If not, difficulties in learning to use the system will be encountered.

8. This is why in design it is critical that a user's mental models be identified and understood.

c. Learning :

1. Learning 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.

2. Our ability to learn is important as it clearly differentiates people from machines.

3. Given enough time people can improve their performance in almost any task.

4. Too often, however, designers use our learning ability as an excuse to justify complex design.

5. Because people can be taught to walk a tightrope is no excuse for incorporating tightropes in a design when walkways are feasible.

6. Learning can be enhanced if it :
   i. Allows skills acquired in one situation to be used in another somewhat like it. Design consistency accomplishes this.
   ii. Provides complete and prompt feedback.
   iii. Is phased, that is, it requires a person to know only the information needed at that stage of the learning process.

d. Skill :

1. The goal of human performance is to perform skillfully.

2. To do so requires linking inputs and responses into a sequence of action.

3. The essence of skill is performance of actions or movements in the correct time sequence with adequate precision.

4. It is characterized by consistency and economy of effort. Economy of effort is achieved by establishing a work pace that represents optimum efficiency.

5. 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.

6. Skills are hierarchical in nature, and many basic skills may be integrated to form increasingly complex ones.

7. Lower-order skills tend to become routine and may drop out of consciousness.

8. System and screen design must permit development of increasingly skillful performance.

e. Individual differences :

1. 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.

2. 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.

3. 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.

4. 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 perform a job.

5. But technology now offers the possibility of tailoring jobs to the specific needs of people with varying and changing learning or skill levels.

6. Multiple versions of a system can easily be created. Design must provide for the needs of all potential users.

Que 2.8. | Describe human consideration in design.

Answer

Human considerations in design :

1. The user's knowledge and experience :

a. The knowledge possessed by a person, and the experiences undergone, shape the design of the interface in many ways.

b. The following kinds of knowledge and experiences should be identified.

    i. Computer literacy : Highly technical or experienced, moderate computer experience, or none.

    ii. System experience : High, moderate, or low knowledge of a particular system and its methods of interaction.

    iii. Application experience : High, moderate, or low knowledge of similar systems.

    iv. Task experience : Level of knowledge of job and job tasks.

    v. Other systems use : Frequent or infrequent use of other systems in doing job.

    vi. Education : High school, college, or advanced degree.

    vii. Reading level : Less than 5th grade, $5^{th} - 12^{th}$, more than 12th grade.

    viii. Typing skill : Expert (135 WPM), skilled (90 WPM), good (55 WPM), average (40 WPM), or "hunt and peck" (10 WPM).

    ix. Native language or culture : English, another, or several.

2. The user's tasks and needs :

The user's tasks and needs are also important in design. The following should be determined :

    i. Type of system use : Mandatory or discretionary use of the system.

    ii. Frequency of use : Continual, frequent, occasional, or once-in-a-lifetime use of system.

    iii. Task or need importance : High, moderate, or low importance of the task being performed.

    iv. Task structure : Repetitiveness or predictability of tasks being automated, high, moderate, or low.

    v. Social interactions : Verbal communication with another person required or not required.

    vi. Primary training : Extensive or formal training, self-training through manuals, or no training.

    vii. Turnover rate : High, moderate, or low turnover rate for jobholders.

viii. Job category : Executive, manager, professional, secretary, clerk.

ix. Lifestyle : For web e-commerce systems, includes hobbies, recreational pursuits, and economic status.

3. The user's psychological characteristics : A person's psychological characteristics also affect one's performance of tasks requiring motor, cognitive, or perceptual skills.

Psychological characteristics :

i. **Attitude :** Positive, neutral, or negative feeling toward job or system.

ii. **Motivation :** Low, moderate, or high due to interest or fear.

iii. **Patience :** Patience or impatience expected in accomplishing goal.

iv. **Expectations :** Kinds and reasonableness.

v. **Stress level :** High, some, or no stress generally resulting from task performance.

vi. **Cognitive style :** Verbal or spatial, analytic or intuitive, concrete or abstract.

4. The user's physical characteristics : The physical characteristics of people can also greatly affect their performance with a system.

Physical characteristics :

i. **Age :** Young, middle aged, or elderly.

ii. **Gender :** Male or female.

iii. **Handedness :** Left, right, or ambidextrous.

iv. **Disabilities :** Blind, defective vision, deafness, motor handicap.

Que 2.9. **What are the characteristics of mandatory use in user's task for design ?**

Answer

Mandatory or discretionary use : Users of the earliest computer systems were mandatory or nondiscretionary. That is, they required the computer to perform a task that, for all practical purposes, could be performed no other way.

Characteristics of mandatory use can be summarized as follows :

i. The computer is used as part of employment.

ii. Time and effort in learning to use the computer are willingly invested.

iii. High motivation is often used to overcome low usability characteristics.

iv. The user may possess a technical background.

v. The job may consist of a single task or function.

Que 2.10. **Give the characteristics of discretionary user.**

Answer

Common general characteristics of the discretionary user are as follows :

i.   Use of the computer or system is not absolutely necessary.

ii.   Technical details are of no interest.

iii. Extra effort to use the system may not be invested.

iv.   High motivation to use the system may not be exhibited.

v.   May be easily disenchanted.

vi.   Voluntary use may have to be encouraged.

vii. Is from a heterogeneous culture.

For the business system discretionary user, the following may also be appropriate :

i.   Is a multifunction knowledge worker.

ii.   The job can be performed without the system.

iii. May not have expected to use the system.

iv.   Career path may not have prepared him or her for system use.

PART-3

Human Interaction Speeds, Understanding Business Function.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 2.11. | **Explain human interaction speed.**

Answer

The speed at which people can perform using various communication methods has been studied by a number of researchers. The following, have been found to be typical interaction speeds for various tasks. These speeds are :

1. Reading :

   i.   The average adult, reading English prose in the United States, has a reading speed in the order of 250-300 words per minute.

   ii. Proofreading text on paper has been found to occur at about 200 words per minute, on a computer monitor, about 180 words per minute.

2. Listening :

i.   Words can be comfortably heard and understood at a rate of 150 to 160 words per minute.

ii. This is generally the recommended rate for audio books and video narration 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.

3. Speaking :

i.   Dictating to a computer occurs at a rate of about 105 words per minute.

ii. Speech recognizer misrecognitions often occur, however, when word correction times are factored in, the speed drops significantly, to an average of 25 words per minute.

iii. It is also found that the speaking rate of new users was 14 words per minute during transcription and 8 words per minute during composition.

4. Keying :

i.   Fast typewriter typists can key at rates of 150 words per minute and higher.

ii. Average typing speed is considered to be about 60-70 words per minute.

iii. Computer keying has been found to be much slower, however.

iv. Speed for simple transcription was only 33 words per minute and for composition only 19 words per minute.

v.   The fastest typists typed at only 40 words per minute, the slowest at 23 words per minute.

vi. Two-finger typists can key memorized text at 37 words per minute and copied text at 27 words per minute.

vii. Something about the computer, its software, and the keyboard does seem to significantly degrade the keying process.

5. Hand printing :

i.   People hand print memorized text at about 31 words per minute.

ii. Text is copied at about 22 words per minute.

Que 2.12. **What are the methods for gaining an understanding of users ?**

Answer

Using the following kinds of techniques to gain an understanding of users, their tasks and needs, the organization where they work, and the environment where the system may be used :

1. Visit user locations, particularly if they are unfamiliar to you, to gain an understanding of the user's work environment.

2. Talk with users about their problems, difficulties, wishes, and what works well now. Establish direct contact; avoid relying on intermediaries.

3. Observe users working or performing a task to see what they do, their difficulties, and their problems.

4. Videotape users working or performing a task to illustrate and study problems and difficulties.

5. Learn about the work organization where the system may be installed.

6. Have users think aloud as they do something to uncover details that may not otherwise be solicited.

7. Try the job yourself. It may expose difficulties that are not known, or expressed, by users.

8. Prepare surveys and questionnaires to obtain a larger sample of user opinions.

9. Establish testable behavioral target goals to give management a measure for what progress has been made and what is still required.

Que 2.13. | **Discuss business and requirement analysis.**

Answer

a. The objective is to establish the need for a system. A requirement is an objective that must be met.

b. A product description is developed and refined, based on input from users or marketing.

c. There are many techniques for capturing information for determining requirements.

d. The techniques listed are classified as direct and indirect :

Direct methods : The significant advantage of the direct methods is the opportunity they provide to hear the user's comments in person and firsthand. Person-to-person encounters permit multiple channels of communication (body language, voice inflections, and so on) and provide the opportunity to immediately follow up on vague or incomplete data. Following are some recommended direct methods for getting input from users :

1. **Individual face-to-face interview :** A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.

2. **Telephone interview or survey :** A structured interview conducted via telephone.

3. **Traditional focus group :** A small group of users and a moderator brought together to verbally discuss the requirements.

4. **Facilitated team workshop :** A facilitated, structured workshop held with users to obtain requirements information, similar to the traditional focus group.

5. **Observational field study :** Users are observed and monitored for an extended time to learn what they do.

6. **Requirements prototyping :** A demo, or very early prototype, is presented to users for comments concerning functionality.

7. **User interface prototyping :** A demo, or early prototypes, is presented to users to uncover user-interface issues and problems.

8. **Usability laboratory testing :** Users at work are observed, evaluated, and measured in a specially constructed laboratory.

9. **Card sorting for websites :** A technique to establish groupings of information for web sites.

Indirect methods : Indirect methods impose an intermediary, someone or something, between the users and the developers. An indirect method of requirements determination is one that places an intermediary between the developer and the user. This intermediary may be electronic or another person. Using an intermediary can certainly provide useful information. Working through an intermediary, however, takes away the multichannel communication advantages of face-to-face user-developer contact. Indirect methods include the following :

1. **MIS intermediary :** A company representative defines the user's goals and needs to designers and developers.

2. **Paper survey or questionnaire :** A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.

3. **Electronic survey or questionnaire :** A survey or questionnaire is administered to a sample of users using e-mail or the web to obtain their needs.

4. **Electronic focus group :** A small group of users and a moderator discuss the requirements online using workstations.

5. **Marketing and sales :** Company representatives who regularly meet customers obtain suggestions or needs, current and potential.

6. **Support line :** Information collected by the unit that helps customers with day-to-day problems is analyzed (Customer support, technical support, help desk, etc.).

7. **E-Mail or bulletin board :** Problems, questions, and suggestions from users posted to a bulletin board or through e-mail are analyzed.

8. **User group :** Improvements are suggested by customer groups who convene periodically to discuss software usage.

9. **Competitor analyses :** A review of competitor's products or websites is used to gather ideas, uncover design requirements and identify tasks.

10. **Trade show :** Customers at a trade show are presented a mock-up or prototype and asked for comments.

11. **Other media analysis :** An analysis of how other media, print or broadcast, present the process, information, or subject matter of interest.

12. **System testing :** New requirements and feedback are obtained from ongoing product testing.

Que 2.14. Designing a website, what kinds of interview questions are appropriate for asking users ?

Answer

If designing a Web site, the following kinds of interview questions are appropriate for asking potential users :

i. Present a site outline or proposal and then solicit comments on the thoroughness of content coverage, and suggestions for additional content.

ii. Ask users to describe situations in which the proposed Web site might be useful.

iii. Ask users to describe what is liked and disliked about the Web sites of potential competitors.

iv. Ask users to describe how particular Web site tasks should be accomplished.

Que 2.15. Explain focus group. What are steps in setting up a focus group ?

Answer

1. Focus group is a small group of users (8 to 12) and a moderator are brought together to discuss the requirements.

2. The purpose of a focus group is to probe user's experiences, attitudes, beliefs, and desires, and to obtain their reactions to ideas or prototypes.

3. Focus groups are not usually useful for establishing how users really work or what kinds of usability problems they really have.

4. Focus group discussion can be influenced by group dynamics, for good or bad.

Steps in setting up focus group :

1. Establish the objectives of the session.

2. Select participants representing typical users, or potential users.

3. Write a script for the moderator to follow.

4. Find a skilled moderator to facilitate discussion, to ensure that the discussion remains focused on relevant topics, and to ensure that everyone participates.

5. Allow the moderator flexibility in using the script.

6. Take good notes, using the session recording for backup and clarification.

Que 2.16. | **Explain card sorting for websites.**

Answer

Card sorting for websites :

i.   Card sorting is a technique used to establish hierarchical groupings of information for Websites.

ii. It is normally used only after gathering substantial site content information using other analysis techniques.

iii. Potential content topics are placed on individual index cards and users are asked to sort the cards into groupings that are meaningful to them.

iv. Card sorting assists in building the site's structure, map, and page content.

v.   The process is as follows :

1. From previous analysis, identify about 50 content topics and inscribe them on index cards. Limit topics to no more than 100.

2. Provide blank index cards for names of additional topics the participant may want to add, and colored blank cards for groupings that the participant will be asked to create.

3. Number the cards on the back.

4. Arrange for a facility with large enough table for spreading out cards.

5. Select participants representing a range of users. Use one or two people at a time and 5 to 12 in total.

6. Explain the process to the participants, saying that you are trying to determine what categories of information will be useful, what groupings make sense, and what the groupings should be called.

7. Ask the participants to sort the cards and talk out loud while doing so. Advise the participants that additional content cards may be named and added as they think necessary during the sorting process.

8. Observe and take notes as the participants talk about what they are doing. Pay particular attention to the sorting rationale.

9. Upon finishing the sorting, if a participant has too many groupings ask that they be arranged hierarchically.

10. Ask participants to provide a name for each grouping on the colored blank cards, using words that the user would expect to see that would lead them to that particular grouping.

11. Make a record of the groupings using the numbers on the back of each card.

12. Reshuffle the cards for the next session.

13. When finished, analyze the results looking for commonalities among the different sorting sessions.

Que 2.17. Describe the steps for creating electronic survey.

Answer

Electronic survey or questionnaire :

i. A questionnaire or survey is administered to a sample of users via e-mail or the Web.

ii. Characteristics, advantages, and disadvantages are similar to paper surveys and questionnaires.

iii. They are, however, significantly less expensive then mailed surveys.

iv. The speed of their return can also be much faster than those distributed in a paper format.

v. In creating an electronic survey:

   1. Determine the survey objectives.

   2. Determine where you will find the people to complete the survey.

   3. Create a mix of multiple choice and open-ended questions requiring short answers addressing the survey objectives.

   4. Keep it short, about 10 items or less is preferable.

   5. Keep it simple, requiring no more than 5-10 minutes to complete.

Que 2.18. Determine the basic business functions.

Answer

i. A detailed description of what the product will do is prepared.

ii. Major system functions are listed and described, including critical system inputs and outputs.

iii. A flowchart of major functions is developed.

iv. Developer will use following process to determine basic business functions :

1. Gain a complete understanding of the user's mental model based upon :

   i. A goal of task analysis, and a goal of understanding the user, is to gain a picture of the user's mental model.

   ii. A mental model is an internal representation of a person's current conceptualization and understanding of something.

iii. Mental models are gradually developed in order to understand, explain, and do something.

iv. Mental models enable a person to predict the actions necessary to do things if the actions have been forgotten or have not yet been encountered.

2. Performing a task analysis :

i. Task analysis involves breaking down the user's activities to the individual task level.

ii. The goal is to obtain an understanding of why and how people currently do the things that will be automated.

iii. Knowing why establishes the major work goals, knowing how provides details of actions performed to accomplish these goals.

iv. Task analysis also provides information concerning workflows, the inter-relationships between people, objects, and actions, and the user's conceptual frameworks.

v. The output of a task analysis is a complete description of all user tasks and interactions.

3. Developing conceptual models :

i. The output of the task analysis is the creation, by the designer, of a conceptual model for the user interface.

ii. A conceptual model is the general conceptual framework through which the system's functions are presented.

iii. Such a model describes how the interface will present objects, the relationships between objects, the properties of objects, and the actions that will be performed.

iv. A conceptual model is based on the user's mental model.

v. Guidelines for designing conceptual models :

1. Reflect the user's mental model, not the designer's.

2. Draw physical analogies or present metaphors.

3. Comply with expectancies, habits, routines, and stereotypes.

4. Provide action-response compatibility.

5. Make invisible parts and process of a system visible.

6. Provide proper and correct feedback.

7. Avoid anything unnecessary or irrelevant.

8. Provide design consistency.

9. Provide documentation and a help system that will reinforce the conceptual model.

10. Promote the development of both novice and expert mental models.

4.   Defining objects :

i.   Determine all objects that have to be manipulated to get work done. Describe :

1.   The objects used in tasks.

2.   Object behavior and characteristics that differentiate each kind of object.

3.   The relationship of objects to each other and the people using them.

4.   The actions performed.

5.   The objects to which actions apply.

6.   State information or attributes that each object in the task must preserve, display, or allow to be edited.

7.   Identify the objects and actions that appear most often in the workflow.

8.   Make the several most important objects very obvious and easy to manipulate.

5.   Developing metaphors :

i.   A metaphor is a concept where one's body of knowledge about one thing is used to understand something else.

ii.   Metaphors act as building blocks of a system, aiding understanding of how a system works and is organized :

1.   Choose the analogy that works best for each object and its actions.

2.   Use real-world metaphors.

3.   Use simple metaphors.

4.   Use common metaphors.

5.   Multiple metaphors may co-exist.

6.   Use major metaphors, even if you can not exactly replicate them visually.

7.   Test the selected metaphors.

Que 2.19.   **Explain the guidelines for designing conceptual models.**

Answer

Guidelines for designing conceptual models :

1.   Reflect the user's mental model, not the designer's :

i.   A user will have different expectations and levels of knowledge than the designer. So, the mental models of the user and designer will be different.

    ii.   The user is concerned with the task to be performed, the business objectives that must be fulfilled.

    iii. The designer's model is focused on the design of the interface, the kinds of objects, the interaction methods, and the visual representations on the screen.

2. **Draw physical analogies or present metaphors :**

    i.   Replicate what is familiar and well known.

    ii.   Duplicate actions that are already well learned.

    iii. The success of graphical systems can be attributed, in part, to their employing the desktop metaphor. A metaphor, to be effective, must be widely applicable within an interface.

    iv. Metaphors that are only partially or occasionally applicable should not be used.

3. **Comply with expectancies, habits, routines, and stereotypes :**

    i.   Create a system that builds on knowledge, habits, routines, and expectancies that already exist. Use familiar associations, avoiding the new and unfamiliar.

    ii.   Use words and symbols in their customary ways.

    iii. Replicate the language of the user, and create icons reflecting already known images.

4. **Provide action-response compatibility :**

    i.   All system responses should be compatible with the actions that elicit them.

    ii.   Names of commands, for example, should reflect the actions that will occur.

    iii. The organization of keys in documentation or help screens should reflect the ordering that actually exists on the keyboard.

5. **Make invisible parts of the system visible :**

    i.   Systems are composed of parts and processes, many of which are invisible to the user.

    ii.   In creating a mental model, a person must make a hypothesis about what is invisible and how it relates to what is visible.

    iii. As more experience is gained, their mental models evolve to become more accurate and complete.

    iv. Making invisible parts of a system visible will speed up the process of developing correct mental models.

6. **Provide proper and correct feedback :** Be generous in providing feedback. Keep a person informed of what is happening, and what has happened, at all times, including :

    i.   Provide a continuous indication of status

    ii.   Provide visible results of actions

    iii. Display actions in progress.

    iv. Present as much context information as possible.

    v.   Provide clear, constructive, and correct error messages.

7. Avoid the unnecessary or irrelevant :

    i.   Never display irrelevant information on the screen.

    ii.   People may try to interpret it and integrate it into their mental models, thereby creating a false one.

    iii. Irrelevant information might be unneeded data fields, screen controls, system status codes, or error message numbers.

    iv. If potentially misleading information cannot be avoided, point this out to the user.

8. Provide design consistency :

    i.   Design consistency reduces the number of concepts to be learned.

    ii.   Inconsistency requires the mastery of multiple models.

    iii. If an occasional inconsistency cannot be avoided, explain it to the user.

    iv. This will prevent the user from falsely assuming that the model he or she has been operating under is incorrect.

9. Provide documentation and a help system that will reinforce the conceptual model :

    i.   Consistencies and metaphors should be explicitly described in the user documentation.

    ii.   This will assist a person in learning the system.

    iii. Do not rely on the people to uncover consistencies and metaphors themselves.

    iv. The help system should offer advice aimed at improving mental models.

    v.   Promote the development of both novice and expert mental

10. Promote the development of both novice and expert mental models :

    i.   Novices and experts are likely to bring to bear different mental models when using a system.

    ii.   It will be easier for novices to form an initial system mental model if they are protected from the full complexity of a system.

    iii. Employ levels of functionality that can be revealed through progressive disclosure.

Que 2.20. **How standard and guidelines valuable to users and developers ?**

Answer

1. Developing and applying design standards or guidelines achieve design consistency. This is valuable to users because the standards and guidelines :
   i. Allow faster performance.
   ii. Reduce errors.
   iii. Reduce training time.
   iv. Foster better system utilization.
   v. Improve satisfaction.
   vi. Improve system acceptance.
2. They are valuable to system developers because they :
   i. Increase visibility of the human-computer interface.
   ii. Simplify design.
   iii. Provide more programming and design aids, reducing programming time.
   iv. Reduce redundant effort.
   v. Reduce training time.
   vi. Provide a benchmark for quality control testing.

☺☺☺

3
UNIT

Screen Designing

CONTENTS

PART-1

Screen Designing : Design Goals.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.1. | **What is screen design ? Define a well designed screen.**

Answer

1. Screen design describes the design of graphical user interface.
2. Screen design includes a wide variety of applications where screens or displays can be used as part of human machine interaction.

A well-designed screen :

1. Reflects the capabilities, needs, and tasks of its users.
2. Is developed within the physical constraints imposed by the hardware on which it is displayed.
3. Effectively utilizes the capabilities of its controlling software.
4. Achieves the business objectives of the system for which it is designed.

Que 3.2. | **Describe the goals in screen design.**

Answer

Goals of screen design :

i. Reduce visual work.
ii. Reduce intellectual work.
iii. Reduce memory work.
iv. Reduce motor work.
v. Minimize or eliminate any burdens or instructions imposed by technology.

PART-2

Screen Planning and Purpose, Organizing Screen Elements.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.3. | **What is meant by screen and define it purpose.**

Answer

1. Each screen element (every control, all text, the screen organization, all emphasis, each color, every graphic, all screen animation, each message, all forms of feedback) must have meaning to users and serve a purpose in performing tasks or fulfilling needs.

2. If an element does not have meaning, do not include it on the screen because it is noise.

3. Noise is distracting, competes for the screen user's attention, and contributes to information overload. That which is important will be more difficult to find.

Que 3.4. | **How we can organize screen elements clearly and meaningfully ?**

Answer

Organizing screen elements clearly and meaningfully :

1. Visual clarity is achieved when the display elements are organized and presented in meaningful and understandable ways.

2. A clear and clean organization makes it easier to recognize screen's essential elements and to ignore its secondary information when appropriate.

3. Clarity is influenced by a multitude of factors such as consistency in design, a visually pleasing composition, a logical and sequential ordering, the presentation of the proper amount of information, groupings, and alignment of screen items.

   Consistency :

1. **Provide real-world consistency :** Reflect a person's experiences, expectations, work conventions, and cultural conventions.

2. **Provide internal consistency :** Observe the same conventions and rules for all aspects of an interface screen, and all application or website screens, including :

   i.   Operational and navigational procedures.

   ii. Visual identity or theme.

   iii. Component.

3. Follow the same conventions and rules across all related interfaces.

4. Deviate only when there is a clear benefit for the user.

PART-3

Ordering of Screen Data and Content, Screen Navigation and Flow.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.5. Describe ordering of screen data and content.

Answer

Ordering of screen data and content :

1. An organizational scheme's goal is to keep to a minimum the number of information variables that the user must retain in short term memory.

2. A logical, meaningful, and sensible arrangement of screen data and content will lower this memory requirement.

3. In ordering screens or pages, units of information and screen elements should be prioritized according to the user's needs and expectations.

4. People develop expectations on how to accomplish certain tasks and find different types of information.

5. A meaningful organization permits faster graphical system.

6. In website design, it is also easier to develop a clear navigation system if the site is meaningfully organized.

7. Clear organization also makes it easier for web users to find what they need, and to predict where a navigation link will take them.

Ordering schemes include the following :

i. Conventional :

1. Through convention and custom, some ordering schemes have evolved for certain elements.

2. Examples are by days of the week, by months of the year, by one's name and address, or along a timeline.

3. These elements should always be ordered in the customary way.

ii. Sequence of use :

1. Sequence of use grouping involves arranging information items in the order in which they are commonly received or transmitted, or in natural groups.

2. An address, for example, is normally given by street, city, state, and zip code.

3. Another example of natural grouping is the league standings of football teams, appearing in order of best to worst records.

iii. Frequency of use :

1. Frequency of use is a design technique based on the principle that information items used most frequently should be grouped at the beginning, the second most frequently used items grouped next, and so forth.

iv. Function or category :

1. Information items are grouped according to their purpose or by some common parameter.

2. All items pertaining to insurance coverage, for example, may be placed in one location.

3. Transportation vehicles may be grouped within the categories of planes, trains, and automobiles.

4. Such grouping also allows convenient group identification using headings for the user.

5. Sub-categories with sub-headings may also be established.

v. Importance :

1. Importance grouping is based on the information's importance to the user's task or need.

2. Important items are placed first or in the most prominent position.

3. Items may be organized from best to worst or largest to smallest.

vi. General to specific :

1. If some data is more general than others, the general elements should precede the specific elements.

2. This will usually occur when there is a hierarchical relationship among data elements. This is a common Web site organization scheme.

Que 3.6. | **What do you mean screen navigation and flow ?**

Answer

1. Screen navigation should be obvious and easy to accomplish.

2. Navigation can be made obvious by grouping and aligning screen controls, and judiciously using line borders to guide the eye.

3. Sequentially, direct a person's attention to elements in terms of their importance.

4. Using the various display techniques, focus attention on the most important parts of a screen.

5. Always tab through a screen in the logical order of the information displayed, and locate command buttons at the end of the tab order sequence.

6. The direction of movement between screen items should be obvious, consistent, and rhythmic.

7. The eye, or pointer, should not be forced or caused to wander long distances about the display seeking the next item.

8. The eye can be guided through the screen with lines formed through use of white space and display elements.

9. Aligning elements will also minimize screen scanning and navigation movements.

10. In establishing eye movement through a screen, also consider that the eye tends to move sequentially, for example :

   i.   From dark areas to light areas.

   ii. From big objects to little objects.

   iii. From unusual shapes to common shapes.

   iv. From highly saturated colors to unsaturated colors.

PART-4

Visually Pleasing Composition, Amount of Information.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.7. | **What do you understand by visually pleasing composition ?**

Answer

1. Visually pleasing composition draws attention subliminally, conveying a positive message clearly and quickly.

2. A lack of visually pleasing composition is disorienting, obscures the intent and meaning, slows one down and confuses one.

3. Graphic design experts have, through perceptual research, derived a number of principles for what constitutes a visually pleasing appearance.

4. The visually pleasing composition does not focus on the words on the screen, but on the perception of structure created by such qualities as spacing, shapes, intensities, and colors, and the relationship of screen elements to one another.

5. It is as if the screen were viewed through "squinted eyes" causing the words themselves to become a blur.

It include following qualities :

1. Balance :

i. Balance is stabilization or equilibrium, a midway center of suspension.

ii. The design elements have an equal weight, left to right, top to bottom.

iii. The opposite of balance is instability; the design elements seemingly ready to topple over.

iv. Our discomfort with instability, or imbalance, is reflected every time we straighten a picture hanging askew on the wall.

v. Balance is most often informal or asymmetrical, with elements of different colors, sizes and shapes being positioned to strike the proper relationships.

vi. Dark colors, unusual shapes, and larger objects are "heavier" whereas light colors, regular shapes, and small objects are "lighter".

vii. Balance on a screen is accomplished through centering the display itself, maintaining an equal weighting of components on each side of the horizontal and vertical axis, and centering titles and illustrations.

2. Symmetry :

i. Symmetry is axial duplication. A unit on one side of the centerline is exactly replicated on the other side.

ii. The exact replication creates formal balance, but the difference is that balance can be achieved without symmetry.

iii. Symmetry's opposite is asymmetry. Our eye tends to perceive something as more compressed or compact when it is symmetric.

iv. Asymmetric arrays are perceived as larger.

3. Regularity :

i. Regularity is a uniformity of elements based on some principle or plan.

ii. Regularity in screen design is achieved by establishing standard and consistently spaced column and row starting points for screen elements.

iii. It is also achieved by using elements similar in size, shape, color, and spacing.

iv. The opposite of regularity is irregularity that exists when no such plan or principle is apparent.

v. A critical element on a screen will stand out better, however, if it is not regularized.

4. Predictability :

i.   Predictability suggests a highly conventional order or plan.

ii. Viewing part of a screen enables one to predict how the rest of the screen will look.

iii. The opposite of predictability is spontaneity that suggests no plan and thus an inability to predict the structure of the remainder of a screen or the structure of other screens.

iv. In screen design, predictability is also enhanced through design consistency.

5. Economy :

i.   Economy, is the frugal and judicious use of display elements to get the message across as simply as possible. The opposite is intricacy, the use of many elements just because they exist.

ii. The effect of intricacy is ornamentation, which often detracts from clarity.

iii. Economy in screen design means mobilizing just enough display elements and techniques to communicate the desired message, and no more.

6. Unity :

i.   Unity is coherence, a totality of elements that is visually all one piece.

ii. With unity, the elements seem to belong together, to dovetail so completely that they are seen as one thing. The opposite of unity is fragmentation, each piece retaining its own character.

iii. In screen design similar sizes, shapes, and colors promote unity, as does white space borders at the display boundary.

iv. Unity should exist between related screens, and web site screens, as well.

7. Sequentiality :

i.   Sequentiality is a plan of presentation to guide the eye through the screen in a logical, rhythmic order, with the most important information significantly placed.

ii. Sequentiality can be achieved by alignment, spacing, and grouping.

iii. The opposite of sequentiality is randomness, whereby an arrangement and flow cannot be detected.

8. Simplicity :

i.   Simplicity is directness and singleness of form, a combination of elements that results in ease of comprehending the meaning of a pattern.

ii. The opposite pole on the continuum is complexity.

iii.   The scale created may also be considered a scale of complexity, with extreme complexity at one end and minimal complexity (simplicity) at the other.

9.   Grouping :

i.   Grouping screen elements aids in establishing structure, meaningful relationships, and meaningful form.

ii.   In addition to providing aesthetic appeal, past research has found that grouping aids in information recall and results in a faster screen search.

Que 3.8. **Discuss the perceptual principles that can be used to aid screen functional groupings.**

Answer

Perceptual principles can be used to aid screen functional groupings :

1.   Use visual organization to create functional grouping :

i.   The most common perceptual principle used in screen design to aid visual groupings has been the proximity principle.

ii.   The incorporation of adequate spacing between groups of related elements enhances the "togetherness" of each grouping.

iii.   Space should always be considered a design component of a screen.

iv.   The objective should never be to get rid of it.

v.   The similarity principle can be used to call attention to various groupings by displaying them in a different intensity, font style, or color.

vi.   The closure and matching patterns principles involve using lines, borders, and unique symbols to identify and relate common information.

2.   Combine visual organization principles in logical ways :

i.   Visual organization principles can be combined to enhance groupings.

ii.   Proximity, a very strong perceptual principle, can guide the eye through an array of information to be scanned in a particular direction.

iii.   Scanning direction can also be made obvious through similarity (color, intensity, and so on) or matching patterns (lines or borders).

3.   Avoid visual organization principles that conflict :

i.   Principles may not always be compatible, however.

ii.   When the viewer encounters incompatibilities, confusion results.

Que 3.9. **How to group screen elements using border ?**

Answer

1. Line borders :

   i.   Line borders, or rules, can greatly enhance a screen.

   ii. Research has found that information displayed with a border around it is easier to read, better in appearance, and preferable.

   iii. While many groupings are obvious without borders, borders certainly reinforce their existence.

   iv. Lines or rules assist in focusing attention on related information.

   v.   They also aid in separating groupings of information from one another.

   vi. Draw borders around elements to be grouped.

   vii. Microsoft Windows provides a control called the Group Box to establish a frame around a group of related controls.

2. Line thickness variations :

   i.   Too many variations in line thickness on a screen create clutter and are distracting. Use no more than three line weights at one time, or two different styles.

   ii. Use a standard hierarchy for rules, the thickest to differentiate major components, the thinnest for minor separation.

   iii. Consider a thin border for individual controls, a slightly thicker border for groupings, and the thickest borders for windows themselves.

3. Consistent line widths and heights :

   i.   Similarly, variations in line widths and heights are distracting.

   ii. Create horizontal lines of equal widths across the screen and vertical lines of equal height whenever possible. This will provide better balance.

4. Sufficient space padding :

   i.   When placing information within borders leave, sufficient space between the information and the borders themselves.

   ii. Avoid looking like you are trying to stuff 6 pounds into a 5-pound sack.

5. Alignment :

   i.   For adjacent groupings with borders, whenever possible, align the borders left, right, top, and bottom.

   ii. The most important alignment points are left and top.

   iii. Do not create right and bottom alignment by leaving excessive white space within the area encompassed by the border. This is not visually appealing.

6. Use lines and borders sparingly :

i. Too many lines and borders on a screen also create clutter and can be distracting.

ii. Like any display technique, lines and borders must be used sparingly.

7. Web pages :

i. In Web page design be cautious in using horizontal lines as separators between page sections.

ii. Users may assume they have reached the bottom of the page, missing what follows.

iii. Separator lines may also make the screen look more cluttered.

iv. In general, reserve horizontal lines for situations where the difference between adjacent areas must be emphasized.

Que 3.10. | **Discuss amount of information.**

Answer

1. Proper amount of information :

i. Presenting too much information on a screen is confusing; there will be greater competition among a screen's components for a person's attention.

ii. Visual search times will be longer, and meaningful structure will be more difficult to perceive.

iii. Presenting too little information is inefficient and may tax a person's memory as information contained on multiple screens may have to be remembered.

2. Present all necessary information :

i. In general, present all information necessary for performing an action or making a decision on one screen.

ii. If information located on different screens must be remembered, a person's memory will again be taxed.

iii. Developing a screen with all the necessary information requires careful analysis of the user's tasks.

3. Screen density :

i. Density is a calculation of the proportion of display character positions on the screen, or an area of the screen containing something.

ii. Density is clearly related to complexity, since both measures "how much is there".

iii. Complexity looks at elements, density at characters, so they should rise and fall together.

iv. There are two types of density to be calculated on a screen :

   a. **Overall density :** Overall density is a measure of the
   percentage of character positions on the entire screen
   containing data.

   b. **Local density :** Local density is a measure of how "tightly
   packed" the screen is.

Que 3.11. | **Discuss the following :**

i. **Webpage size**
ii. **Scrolling and paging**

Answer

i. **Webpage size :** Webpage design depends on the following :

1. **Minimize page length :**

   a. Restrict to two or three screens of information.

   b. Page length can be shorter or longer.

2. **Place critical or important information at the very top :**

   a. Critical or important information should be placed where it will be
       immediately visible when the page is displayed.

   b. In webpage design, this is referred to as "above the fold".

   c. Locate it within the top 4 inches of page.

ii. **Scrolling and paging :**

1. In screen design the favored method of asking the user to move between
    screens of information has been through paging.

2. A full screen of information is presented, the user does what is necessary
    to do to the screen, and then the entire screen is transmitted through a
    key action.

3. If other user actions are then necessary to accomplish an objective,
    another full screen is presented and the process continues until an
    ending is reached.

4. This method of interaction was practical and efficient for computer and
    monitor technology existing at that time, and it presented the user
    consistent and meaningful "chunks" of information to work on.

5. Screen scrolling as an interaction method was also used over this time
    period but on a much more limited basis.

6. User performance is improved using paging and scrolling.

7. There are two possible ways to control and view a scrolling screen :

   a. **Telescope method :** In the telescope method, the model is that of
       a telescope, the window moves around the screen data much as a
       telescope scans the stars in the night sky.

   b. **Microscope method :** In the microscope method, the screen data
       appears to move under a fixed viewing window, the way an object

placed under a microscope is manually moved around to see it in its entirety.

8. The telescope method is more natural and causes fewer errors, and it was implemented.

9. This is why, when scrolling today, clicking the up arrow on the scroll bar causes the data displayed on a screen to move downward.

10. The data is not actually moving, the telescope through which the data is being viewed is moving upward.

Que 3.12. | **How to minimize the problems in scrolling ?**

Answer

To minimize the problems in scrolling :

1. Avoid scrolling to determine page contents :
   i. A page's subject should be immediately recognizable.
   ii. Elements crucial to identifying a page's contents must be viewable without requiring page scrolling.
   iii. If not visible when the page is first displayed, these elements may never be seen.
   iv. Place these contents in the top 4 inches of the page.

2. Minimize vertical scrolling :
   i. Some scrolling may be necessary to view the entire contents of a page.
   ii. Minimize the requirement for vertical scrolling when defining, organizing, and laying out a page's components. For example, avoid large graphics and excessive amounts of white space.
   iii. Place closest to the page's top the information most likely to be needed.

3. Provide contextual scrolling cues and a unique end-of-page structure :
   i. Lower parts of a page may be overlooked, especially if the visible portion appears to satisfy the user's needs and the user erroneously concludes that no more can be done.
   ii. For pages exceeding one screen in length, provide contextual cues to the user that part of the page is hidden and that viewing the entire page will necessitate scrolling.

4. Avoid horizontal scrolling :
   i. While some vertical scrolling is now acceptable in Web page design, horizontal scrolling must be avoided.
   ii. A page too wide to be completely displayed within the confines of a screen will require continuous scrolling as reading is performed.

iii. This is extremely cumbersome and inefficient.

5. Encourage use of paging :

   i.   Full-screen paging on the Web can be done by using the page-up and page-down keys or clicking on the scroll bar page-up or page-down icons.

   ii. Text is then moved by the number of lines equaling screen size.

   iii. This is almost always faster than scrolling a line at a time.

   iv. Some recent studies have addressed the issue of Web page scrolling and paging.

6. Paging version :

   i.   Ensure the availability of full pages for reading and searching on the Web and, by creating a second version of a website, one consisting of individual screens that are viewed through "paging".

PART-5

Focus and Emphasis, Presentation Information Simply and Meaningfully.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.13. Discuss about the term 'Distinctiveness'.

Answer

1. Elements of screen must be distinct, clearly distinguished from one another.

2. Distinctiveness can be enhanced through separation and contrast.

3. All screen elements must be perceptually distinct.

4. Distinctiveness is achieved by providing adequate separation between adjacent elements and screen boundaries and providing adequate separation between parts of an element.

5. Screen controls, field and group borders, and buttons should not touch window borders or each other.

6. Colors or shades used for adjacent screen elements must also contrast well with one another.

Que 3.14. Discuss the techniques to provide emphasis.

Answer

Following are the techniques used to provide emphasis :

1. Brightness :

i. A brighter element has a good attention-getting quality and no disturbing features.

ii. It may be used to indicate items in error, and increased brightness is the best vehicle for calling attention to data on inquiry screens.

iii. Do not use more than two brightness levels on a screen.

iv. If brightness has a fault, it is that displays with improperly set manual screen contrast controls can diminish its effectiveness, even causing it to disappear.

2. Reverse polarity :

i. Inverse video reverses an element's polarity.

ii. For old text-based screens, reverse polarity meant displaying dark text on a light background, or reversing the standard light text on dark background.

iii. For elements of screens-pieces of data, messages, and so on-reverse polarity has a very high attention-getting quality.

iv. It can be effectively used for items selected, items in error, information being acted upon, or information of current relevance.

3. Fonts :

i. Differences in fonts have a moderate attention-getting capability.

ii. Their varying sizes and shapes can be used to differentiate screen components.

iii. Larger, bolder letters can be used to designate higher-level screen pieces, such as different levels of headings, if the headings are used to search for something.

iv. Do not use larger fonts, however, for entry/modification (conversational) and display/read-only screens, because this will place too much emphasis in the headings themselves.

4. Underlining :

i. Underlining is a moderate attention-getting mechanism but it can reduce legibility, so it should be used conservatively and carefully.

ii. In graphical systems it is commonly used to designate keyboard equivalents or mnemonics.

iii. In web pages it is used to designate navigation links.

5. Blinking :

i. Blinking has a very high attention-getting capability, but it reduces text readability and is disturbing to most people.

ii. It often causes visual fatigue if used excessively.

    iii. Therefore, it should be reserved for urgent situations and times when a quick response is necessary.

    iv. A user should be able to turn off the blinking once his or her attention has been captured.

6. Colors :

    i. Use color to emphasize and assist in the identification of screen components.

    ii. Some colors appear brighter than others.

    iii. Display no more than four colors at one time on a screen essentially alphanumeric in nature, six on a statistical graphics screen.

7. Other emphasis techniques :

    i. Displaying the element in a larger size, placing an element in a position where the eye first meets the screen.

    ii. Isolating the element from the remainder of the screen.

    iii. Presenting the element in a distinctive or unusual shape.

    iv. Using white space to emphasize blocks of text.

8. De-emphasize less important elements : To designate an element as not applicable or not active, dim it or gray it out.

Que 3.15. | **How to convey depth of levels or a three-dimensional appearance ?**

Answer

The spatial composition of a screen can also be communicated by using perspective, highlighting, shading, and other techniques to achieve a three-dimensional appearance.

Techniques used to achieve a three-dimensional appearance include :

1. Overlapping :

    i. Fully display the window or screen element of current relevance and partially hide beneath it other screen windows or elements.

    ii. The completeness or continuity of outline of the relevant element will make it appear nearer than those partially covered.

2. Drop shadows :

    i. To further aid in the perception of the placement of a pull-down above a screen, or a window above a screen or another window, locate a heavier line along the bottom and right edges of the pull-down or window.

    ii. This creates the impression of a shadow caused by a light source in the upper-left corner of the screen, reinforcing the nearness of the important element.

    iii. The light source should always appear to be upper left, the shadow lower right.

3. Highlighting and lowlighting :

i.   Highlighted or brighter screen elements appear to come forward, while lowlighted or less bright elements recede.

ii. Attention will be directed to the highlighted element.

4. Shrinking and growing :

i.   Important elements can be made to grow in size, while less important elements remain small or shrink.

ii. An icon, for example, should expand to a window when it is selected.

iii. The movement, as it expands, will focus attention upon it.

5. Color change :

i.   Objects farther away appear hazy and less saturated.

ii. Increase haziness as screen element importance diminishes; display currently relevant elements more vividly.

6. Size change :

i.   Objects farther away appear smaller.

ii. Decrease the size of non-applicable screen elements; display currently relevant elements as larger.

7. Clarity change :

i.   Objects not at the eye's focus distance appear fuzzy or blurred.

ii. Display non-applicable elements as blurred, and currently relevant screen elements as clear.

8. Vertical location :

i.   The horizon appears higher, objects up close lower.

ii. Present currently applicable screen elements at the bottom of the screen, present non-applicable elements at the screen's top.

9. Spacing change :

i.   Faraway objects appear more closely spaced, closer objects more widely spaced.

ii. Display non-applicable elements as more closely spaced, currently applicable screen elements as more widely spaced.

10. Receding lines : Parallel lines converging and receding to a vanishing point imply depth.

11. Motion change : Objects moving at uniform speeds appear to be moving more slowly the farther away they are.

Que 3.16. **How information is presented simply and meaningfully ?**

Answer

Following are guidelines for presenting information on screens. The fundamental goals are clarity and simplicity in form, comprehensibility in organization, efficient information assimilation, and pleasantness in tone.

1. Legibility :

i. Legibility is distinguishableness.

ii. The type should be of the proper kind and of adequate size and clarity for viewers of all ages.

iii. The contrast between text and its background should be adequate.

iv. The legibility of screen text still does not match that of text presented on paper.

2. Readability :

i. When we read, we use the shape of a word as a strong aid in comprehension; often we do not read individual letters but recognize word shapes.

ii. Words are given more distinctive shapes by letter "ascenders" and "descenders".

iii. Ascenders are letter strokes that rise above the x (height of lower case letter). Descenders are letter strokes that drop below the x.

3. Usability :

i. Screen information should be presented in a directly usable form.

ii. Reference to documentation or other extra steps for interpretation should never be required.

iii. In graphical system design, content consisting of words and text is much faster to comprehend and use than content in a graphical form.

4. Contrasting display features :

i. Use contrasting display features to call attention to different screen components, items being operated upon, or urgent items.

ii. Usable features include such things as letter style, size, and color.

iii. Features chosen should provide perceptual cues to aid in screen component identification so that attention may be quickly and accurately focused.

iv. Perceptual cues clarify structure and relationships, and give hints to the reader.

v. Good readers make great use of the typographic and semantic cues found in well-presented text.

4. Visual lines :

i. The eye should be guided vertically or horizontally implicitly through the screen through the use of white space and content, typefaces, and control alignments.

ii. In situations where a large amount of information must be presented on one screen, eye movement direction may also be communicated to the viewer explicitly, through the drawing of actual vertical or horizontal rules.

iii. Purposeless, unfettered wandering of the eye should be discouraged.

5. Consistency :

i. Methods chosen to present information must always be consistent in visual appearance and procedural usage.

Que 3.17. | **Discuss about typography.**

Answer

Typography :

1. Typography is the art of laying out text for print or on screens for aesthetics and readability.

2. In typography, a typeface is the name of a type, such as Times New Roman, Arial, Verdana, or Helvetica.

3. A font is a typeface of a particular size, such as Times Roman 16 point or Arial 12 point.

4. In screen design, the terms have become somewhat interchangeable and different fonts are used to organize information, establish importance, establish a reading order, and create a particular mood.

5. A seemingly unending supply of typefaces, styles, and sizes are available for these purposes.

6. Operating system and Web browser providers have also provided default fonts for various system components.

7. Many screen users also have the ability to change fonts to suit their own liking, although many rarely do.

8. Using too many techniques at one time only leads to screen clutter and the impression of confusion.

    a. Font types and families :

      i. Visually simple, common, readable fonts are needed for clarity on most screens, including business system applications and the text content of webpages.

      ii. A family of styles is designed to complement one another, creating unity in design. An example of a family is that of times.

    b. Font size :

      i. Font sizes are described by points-the distance between the top of a letter's ascender and the bottom of its descender.

    ii.   One point equals 1/12 inch.

    iii.   Font sizes should be large enough to be legible on standard monitors.

c. **Font styles and weight :**

    i.   **Styles :** Italics may be used to emphasize something or attract attention on a screen. Because it may be hard to read on many monitors, it should be used sparingly.

    ii.   **Boldface :** Use bold when you want to call attention to something. Typically, screens will be used again and again, and something bold often becomes too visually heavy.

    iii. **Underline :** In Web pages, an underline is used to designate a navigation link. It should only be used for this purpose. Its use in any other way will be confusing to the user.

d. **Font case :**

    i.   The screen designer often has the choice of whether to display screen components in mixed case or upper case.

    ii.   Upper case means all capital letters.

    iii. Mixed case usually implies a predominance of lowercase letters with occasional capitalization as needed.

PART-6

Information Retrieval on Web, Statistical Graphics.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.18. | **Discuss about information entry and modification screens.**

Answer

i.   Information entry and modification (conversational) screens are used to collect and modify information, either by entry or selection.

ii. These screens are sometimes referred to as conversational screens.

iii. They guide a person through a task or process.

iv. The screen itself is the user's focal point for working with information.

1. **Organization :**

    i.   Organize these screens logically and clearly, reflecting the exact information needs of the user for the task being performed.

ii.   In general, place the most frequently used information, or required information, on the earliest screens and at the top of screens.

2. Captions :

i.   Provide meaningful captions, clearly identifying the information to be entered or selected.

ii.   Use the headline style to display them (all significant words capitalized).

iii. Consistently position all captions in relation to their associated controls. They may be left- or right-aligned.

3. Text boxes/selection controls :

i.   Designate by boxes, using either a line border or polarity reversal.

4. Spacing and groupings :

i.   Create logical medium-size groupings of from 5 to 7 elements.

5. Headings :

i.   Provide headings to identify groupings. Set off from their related controls using upper case or mixed-case headline style.

6. Control arrangement :

i.   Align controls into columns. Maintain a top-to-bottom, then left-to-right arrangement.

7. Required and optional input :

i.   Distinguishing between required and optional data input may or may not be necessary on these screens.

ii.   The decision on whether or not to distinguish these types of data should be based on the experience of the user doing the key entry, and the information's familiarity.

iii. When a technique to distinguish them is included on a screen, it is a form of completion aid so the arguments for and against completion aids are applicable here as well.

8. Instructions and completion aids :

i.   It is necessary to include instructions and completion aids on screens.

ii.   Locate instructions so they precede the controls to which they apply.

iii. Locate completion aids to the right of the controls to which they apply.

Que 3.19. **Discuss intranet and extranet design guidelines.**

Answer

Intranet design guidelines :

i.   Intranets are internal closed systems that use the capabilities of the Internet.

ii. Most intranets suffer in comparison to their Internet siblings because of poor navigation and a lack of design standards.

The following intranet design guidelines :

1. Home page :

   i. Provide a single home page containing at least a directory hierarchy, a search facility, and a current news segment.

   ii. The directory will provide a structured overview of the sites content.

   iii. The search facility will provide a means of quickly accessing the site's index.

   iv. Unlike a generic facility, this local facility can present information about the importance of the item or topic of interest to the organization.

   v. The news segment can include information about the company and things that are of interest to employees.

2. Visual style :

   i. Since the Internet and an intranet are different information spaces, a complementary but distinguishing look will quickly inform the users should they wander outside of the closed internal net to the public site.

   ii. The style should also be unified and consistent throughout its entire structure.

3. Task-oriented :

   i. An intranet will be more task-oriented and less promotional.

4. Options and features :

   i. Since the site will be frequently used by employees, it will be understood and learned faster (if unified in design).

   ii. More options and features can exist since feelings of intimidation and being overwhelmed are much less likely to occur.

5. Navigational system :

   i. A stronger navigational system will be necessary because the intranet will encompass a much larger amount of information.

   ii. Movement between servers may be necessary.

Extranet design guidelines :

1. An extranet is part of an organization's intranet that may be accessed from the Internet.

2. It is a mixture of the Internet and the intranet, its design should reflect this.

3. Since its users will access it from the Internet, its visual style and navigation should be similar to the Internet site to indicate companionship but subtly different to connote its independence.

4. Links to locations on the public Internet site may be included.

Que 3.20. | **Write short note on statistical graphics.**

Answer

Statistical graphics :

1. A statistical graphic is data presented in a graphical format.

2. A well-designed statistical graphic, also referred to as a chart or graph, consists of complex ideas communicated with clarity, precision, and efficiency.

3. It gives its viewer the greatest number of ideas, in the shortest time, and in the smallest space, and with least possible clutter.

4. It will also induce the viewer to think of substance, not techniques or methodology.

5. It will provide coherence to large amounts of information by tying them together in a meaningful way, and it will encourage data comparisons of its different pieces by the eye.

6. A well designed statistical graphic display also avoids distortions by telling the truth about the data.

Que 3.21. | **Explain the components of statistical graphics.**

Answer

Components of a statistical graphic :

Most statistical graphics have at least two axes, two scales, an area to present the data, a title, and sometimes a legend or key. Guidelines for graphic components include the following :

1. Data presentation :

   i. Emphasize the data.

   ii. Minimize the non data elements.

   iii. Minimize redundant data.

   iv. Show data variation, not design variation.

   v. Provide the proper context for data interpretation.

   vi. Restrict the number of information carrying dimensions depicted to the number of data dimensions being illustrated.

   vii. Employ data in multiple ways, whenever possible.

   viii. Maximize data density.

2. Axes :

   i. Values on an axis should increase as they move away from the origin.

    ii.   Use the horizontal axis (X) to show time or cause of an event (the independent variable).

    iii. Use the vertical axis (Y) to show a caused effect (the dependent variable).

3. Scales and scaling :

    i.   Place ticks to marks scales on the outside edge of each axis.

    ii.   Employ a linear scale.

    iii. Mark scales at standard or customary intervals.

    iv. Start a numeric scale at zero (0).

    v.   Keep the number of digits in a scale to a minimum.

    vi. Display only a single scale on each axis.

    vii. For large data matrices, consider displaying duplicate axes.

    viii. Provide aids for scale interpretation.

    ix. Provide scaling consistency across two or more related graphics.

    x.   Clearly label each axis in a left-to-right reading orientation.

4. Proportion :

    i.   Provide accurate proportion of the displayed surfaces to the data they represent.

    ii.   Provide proper proportion by :

        a. Conforming to the shape of the data.

        b. Making the width greater than the height.

5. Lines :

    i.   Data lines should be the heaviest.

    ii.   Axes lines should be of medium weight.

    iii. Extend the lines entirely around the graphic.

    iv. Grid lines should be very thin or absent.

6. Labeling :

    i.   Employ clear, detailed and thorough labeling.

    ii.   Maintain a left-to-right reading orientation.

    iii. Integrate the labeling with the drawing.

    iv. Do not curve letters to match the shape of curved lines.

    v.   Use only one typeface, font, and weight.

    vi. Do not separate labeling from the data through ruled lines.

    vii. Provide information about the source of the data.

    viii. Use a legend for complicated graphs.

7. Title :

    i.   Create a short, simple, clear, and distinctive title describing the purpose of the graphic.

    ii.   Position the title above, centered, or left-aligned to the rectangle formed by the extended axes.

    iii.   Spell it out fully, using a mixed-case or uppercase font.

8. Aiding interpretation of numbers :

    i.   Display a grid on request.

    ii.   Permit the viewer to click on a data point to display actual values.

    iii.   Show numeric values automatically for each point or bar.

    iv.   Permit the viewer to zoom in on an area of the graphic.

    v.   Permit the user to change the scale values.

    vi.   Permit toggling between a graphic and a table.

Que 3.22. | **What are the types of statistical graphics ?**

Answer

Types of statistical graphics :

1. Curve and line graphs :

    i.   Curves and line graphs can be used to show relationships between sets of data defined by two continuous variables.

    ii.   They are especially useful showing data changes over time, being superior to other graphic methods for speed and accuracy in determining data trends.

    iii.   With a curve, the data relations are summarized by a smoothed line. With a line, straight line segments connect the data plots.

    iv.   A line graph is illustrated in Figure 3.22.1. This kind of graph implies a continuous function.

    v.   If the data point elements are discrete, it is better to use a bar graph.
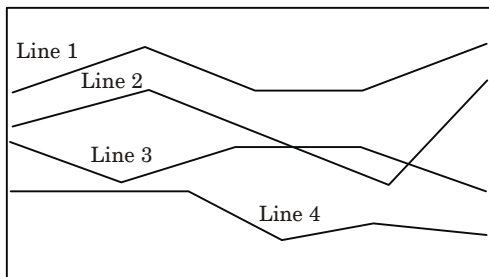
Fig. 3.22.1. A line graph.

2. Surface charts :

i.   If the data being depicted by a curve or line represents all the parts of a whole, consider developing a surface chart, as illustrated in Figure 3.22.2.
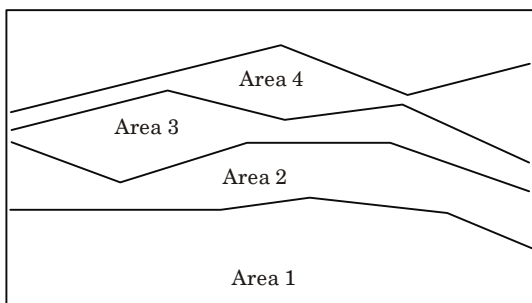
Fig. 3.22.2. A surface chart.

ii. In this kind of graph, the curves or lines are stacked above one another to indicate individual amounts or aggregated amounts.

iii. Each boundary height is determined by the height of the line below it, and the area between each line or curve is differently coded, usually by textures or shading.

iv. A surface chart is similar to a segmented bar chart.

3. Scatterplots :

i.   Scatterplots can be used to show relationships among individual data points in a two-dimensional array.

ii. A point is displayed on the plot where the X-axis and Y-axis variables intersect, as illustrated in Figure 3.22.3.

iii. Correlations and trends on scatterplots can be indicated by the superimposition of curves (thus combining the scatterplot with another kind of graphic display).
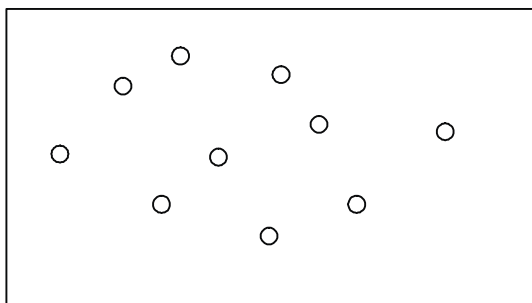
Fig. 3.22.3. A scatterplot.

4. Bar graphs :

i.   Bar graphs can be used to show a few differences between separate entities or to show differences in a variable at a few discrete intervals.

ii. A bar graph consists of a series of bars extending from a common origin or baseline, as illustrated in Figure 3.22.4, or they may extend between separately plotted high and low points, as illustrated in Figure 3.22.5, having only one axis.

iii. Bar graphs may be arrayed horizontally or vertically. Vertical bar graphs are sometimes called column charts.
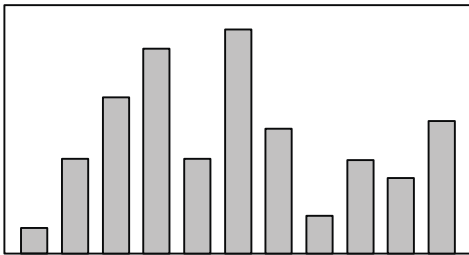
Fig. 3.22.4. A bar graph with a common origin point.
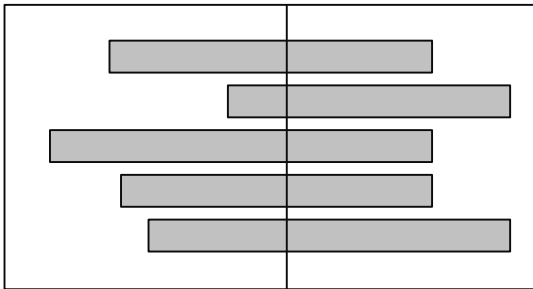
Fig. 3.22.5. A bar graph with separately plotted high and low points.

5. Segmented or stacked bars :

i.   If both the total measure of a value and its component portions are of interest, consider using segmented or stacked bars.

ii. These bars are similar to bar graphs except that the bar is segmented into two or more pieces reflecting the component values, as illustrated in Fig. 3.22.6.

iii. In this way they are similar to surface graphs and pie charts.
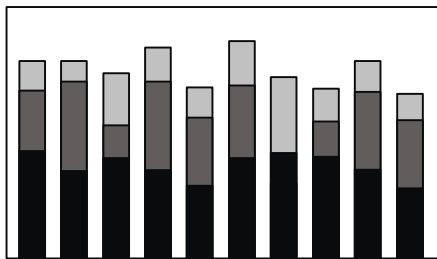
Fig. 3.22.6. A segmented, or stacked, bar graph.

6. Pie charts :

i.   Pie charts, a circle broken up into pie-shaped pieces, can be used to show an apportionment of a total into its component parts, as illustrated in Fig. 3.22.7.

ii. Bar graphs, however, usually permit more accurate estimates of proportions.

iii. Experts caution against the use of pie charts because :

   a.   They provide no means of absolute measurement.

   b.   They cannot represent totals greater than 100 percent.

   c.   They can only represent a fixed point in time.

   d.   Human estimation of relationships is more accurate with linear than with angular representations.
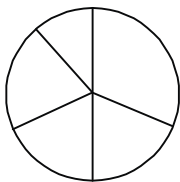
Fig. 3.22.7. A pie chart.

7. Flow charts :

i.   If the data to be displayed flows in a complex, yet sequential, process, consider using a flowchart to schematically represent it.

ii. Flowcharts can also be used to aid problem solving in which a solution can be reached by answering a series of questions.

iii. They are not useful when trade-offs must be made.

PART-7

Technological Considerations in Interface Design.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.23. Discuss technical consideration in interface design for :

i. Graphical system

ii. Web system

iii. Other web consideration

Answer

Interface design is affected by the physical characteristics of the display device itself and the characteristics of the interfaces controlling software.

i. Graphical system :

1. Graphical system design must be compatible with the system's power, screen size, screen resolution, and displayable colors, fonts and other features.

2. Designs for Web systems must also take into consideration the characteristics of the browsers being used and the bandwidth of the communication medium.

3. The design must also be compatible with the system platform and any development and implementation tools being used.

4. The design must also take into consideration any available platform style guide.

5. Screen design must be compatible with the capabilities of the system, including :

a. System power :

1. A slow processing speed and small memory may inhibit effective use of a system.

2. Feedback and animation capabilities may be limited, reducing the system's usability.

3. Slow responses can be error prone, grossly inefficient, and very aggravating.

4. A system must be powerful enough to perform all necessary actions promptly, responsively, and meaningfully.

b. Screen size :

1. Through the years, the physical size of an available monitor's screen area has been gradually increasing.

2. Current typical monitor sizes range from 13 to 21 inches (measured diagonally), with 17 inches being most common.

c. Screen resolution :

1. Screen resolution is the horizontal and vertical height of a screen in pixels.

2. It is a function of the monitor's capabilities and its video card.

3. Most common display resolutions currently are 640 × 480 (pixels width and height), 800 × 600, and 1024 × 768. Higher resolutions are also available.

4. Poor screen resolution may deter effective use of a graphical system by not permitting sharp and realistic drawings and shapes.

5. Window structure and icon design may be severely affected.

d. Display colors :

1. The color palette must be of a variety large enough to permit establishment of a family of discriminable colors.

2. The colors used must be accurately and clearly presented in all situations.

3. The contextual effect of colors must also be considered, because hues may change based on factors such as size and one color's location in relation to other colors.

e. Other display features :

1. A wide range screen attributes or properties are available to aid the screen design process.

2. Included are such techniques as higher brightness, reverse polarity, different font sizes and styles, underlining, blinking, line rules and boxes, color, and white space.

3. Before beginning design, the designer must be aware of what capabilities exist, how they may be most effectively used, and what their limitations are.

ii. Web systems :

1. The Web is truly a Web, a Web of users whose only consistency is inconsistency in the variety of the technologies they possess.

2. Monitors with small screens must coexist with large screens.

3. Color must coexist with monochrome displays.

4. High-resolution displays must coexist with those of low resolution.

5. High-speed information transmission must coexist with low speed.

6. New browsers that contain and support many different and desirable features must coexist with old browsers that support little.

7. To make matters worse for the designer, users can reconfigure their own PCs, further changing some of its characteristics.

8. The designer must be capable of handling these various demands while creating usable.

9. Web pages accessible through different browsers, operating systems, and computer platforms.

10. To do this requires having an awareness of system configurations that satisfy the needs of the majority of users, and then designing for these users.

11. To utilize the Web's richest features, however, the designer must understand the current level of technology and apply it in a meaningful and usable way, especially for those users at the high end of the technological spectrum.

12. The temptation, though, to apply technology simply for technology's sake must be resisted.

13. The goal in design is to satisfy the user's need or want, not the designer's.

14. Following are some technological considerations that affect the website design :

  a. Browsers :

    1. The pressure for lowest-common-denominator design is often outweighed by the designer's desire to create larger displays and employ the latest display and browser features.

    2. The needs of all users must be considered in design.

  b. Compatibility :

    1. The entire Web page content should be accessible from the browsers of all users, presenting content as consistently and predictable as possible.

    2. Avoid fancy technology; many people still use old browsers that do not support such things as frames or JavaScript. Newer browsers will interpret Java applets.

  c. Monitor size and resolution :

    1. Designed page content should always be restricted to the boundaries of an "imagesafe" area horizontally, and perhaps vertically, depending upon whether vertical scrolling is determined as necessary to see the page's entire content.

    2. Exceeding the horizontal safe area will require horizontal scrolling to see the page's entire width. Because some information will not always be visible, content usability and interpretation will be severely degraded, and the user inconvenienced.

  d. Fonts :

    1. Not all browsers provide the same typographic operations.

    2. Different default font types and sizes may exist, depending on the type of browser, browser version, and operating system the browser runs on.

3. If a page is designed using a font the user does not have installed, the browser displays its default fonts.

4. Many older browsers support only two fonts, Times Roman and Courier.

5. Default fonts may include Times New Roman, Arial, Helvetica, and Verdana.

e. Bandwidth :

1. The amount of data that can travel through a communication channel in a given amount of time is called bandwidth.

2. Currently, the typical Web user is dialing in at 56 kilobytes per second (kbps) through a regular telephone line.

3. While a cable modem is currently the most reliable high speed connection to the Web for home users.

f. Color :

1. The color palette must be of a variety large enough to permit establishment of a family of discriminable colors.

2. The colors used must be accurately and clearly presented in all situations, but be aware that colors may appear slightly differently on different monitors, and all users may not default their palettes to high color settings.

3. Use colors that will succeed on a variety of platforms and monitors. Design using a browser-safe, cross-platform palette of 216 colors.

g. Versions :

1. To provide universal access to a website, provide multiple versions that support multiple browsers.

2. To limit the site to one browser may deny access to, and alienate, users who do not have the proper one.

3. Make use of browser "sniffers", (programs on the server that detect the user's browser type and determine which version should then be downloaded).

4. Always provide a text-only version of the website. This will be necessary as long as users with small displays and low bandwidths exist.

iii. Other web consideration :

1. Downloading :

i. Slow download speeds are an ongoing complaint of Web users.

ii. Download times of 8 to 10 seconds per page should not be exceeded, even for bandwidths of 28.8 kbps.

iii. In general, keep graphics and page size as small as possible.

iv. Specifically, use text instead of graphics whenever possible.

v. Also, repeatedly use a graphic so it may be stored in the browser's cache. The cache is a temporary storage area for Web pages and images.

vi. Once a graphic is downloaded, it is placed in the cache and remains there for a prescribed period of time.

2. Currency :

i. Update the Web site regularly to keep information current. The nature of the Web implies timeliness.

ii. Outdated information casts doubts on a Web site's credibility. Currency means trustworthiness to many users.

3. Page printing :

i. Some people prefer to read hard copy, especially anything longer than half a page.

ii. Make printing easy for users, including the capability to print sections, pages, or groups of related pages with minimal effort.

iii. Since most low-end printers print at 300 dpi, pages may be printed at this resolution.

iv. This higher resolution will result in a longer printing time, however.

4. Maintainability :

i. Provide easy website maintainability to sustain its currency.

ii. Change must be easily accommodated as the website grows, evolves, and matures.

iii. Website maintenance means website enhancement.

iv. Remove outdated information and expired links, link old pages to those newly created.

v. Properly designed, modular system pages covering specific topics can be updated quickly without needing to change and reformat large amounts of information.

☺☺☺

4
UNIT

Windows

CONTENTS

PART-1

Windows : New and Navigation Schemes Selection.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.1. **Discuss windows and its characteristics.**

Answer

1. A window is an area of the screen, usually rectangular in shape, defined by a border that contains a particular view of some area of the computer or some portion of a person's dialog with the computer.

2. It can be moved and rendered independently on the screen.

3. A window may be small, containing a short message or a single field, or it may be large, consuming most or all of the available display space.

4. A display may contain one, two, or more windows within its boundaries.

5. A window is seen to possess the following characteristics :

   i. A name or title, allowing it to be identified.

   ii. A size in height and width (which can vary).

   iii. A state, accessible or active, or not accessible. (Only active windows can have their contents altered.)

   iv. Visibility (the portion that can be seen) a window may be partially or fully hidden behind another window, or the information within a window may extend beyond the window's display area.

   v. A location, relative to the display boundary.

   vi. Presentation, that is, its arrangement in relation to other windows. It may be tiled, overlapping, or cascading.

   vii. Management capabilities, methods for manipulation of the window on the screen.

   viii. Its highlight, that is, the part that is selected.

   ix. The function, task, or application to which it is dedicated.

Que 4.2. **What are the components of window ?**

Answer

Components of a window :

1. Frame :

    i.   A window will have a frame or border, usually rectangular in shape, to define its boundaries and distinguish it from other windows.

   ii.   While a border need not be rectangular, this shape is a preferred shape for most people. Also, textual materials, which are usually read from left to right, fit most efficiently within this structure.

  iii.   The border comprises a line of variable thickness and color.

2. Title bar :

    i.   The title bar is the top edge of the window, inside its border and extending its entire width.

   ii.   This title bar is also referred to by some platforms as the caption, caption bar, or title area.

  iii.   The title bar contains a descriptive title identifying the purpose or content of the window.

3. Title bar icon :

    i.   Located at the left corner of the title bar in a primary window, this button is used in windows to retrieve a pull-down menu of commands that apply to the object in the window.

   ii.   It is 16×16 version of the icon of the object being viewed.

  iii.   When clicked with the secondary mouse button, the commands applying to the object are presented.

4. Window sizing buttons :

    i.   Located at the right corner of the title bar, these buttons are used to manipulate the size of a window.

   ii.   The leftmost button, the minimize button (used to reduce a window to its minimum size, usually an icon). It also hides all associated windows.

  iii.   The maximize button enlarges a window to its maximum size, usually the entire screen.

5. Menu bar :

    i.   A menu bar is used to organize and provide access to actions.

   ii.   It is located horizontally at the top of the window, just below the title bar.

  iii.   A menu bar contains a list of topics or items that, when selected, are displayed on a pull-down menu beneath the choice.

6. Status bar :

    i.   Information of use to the user can be displayed in a designated screen area or areas.

    ii.   They may be located at the top of the screen in some platforms and called a status area, or at the screens bottom.

    iii.   Microsoft recommends the bottom location and refers to this area as the status bar.

    iv.   It is also referred to by other platforms as a message area or message bar.

7.   Scroll bars :

    i.   When all display information cannot be presented in a window, the additional information must be found and made visible.

    ii.   This is accomplished by scrolling the display's contents through use of a scroll bar.

    iii.   A scroll bar is an elongated rectangular container consisting of a scroll area or shaft, a slider box or elevator, and arrows or anchors at each end.

8.   Split box :

    i.   A window can be split into two or more pieces or panes by manipulating a split box located above a vertical scroll bar or to the left of a horizontal scroll bar.

    ii.   A split box is sometimes referred to as a split bar.

Que 4.3. | **Describe the window presentation style.**

Answer

Window presentation styles : The presentation style of a window refers to its spatial relationship to other windows. There are two basic styles, commonly called tiled or overlapping :

1.   Tiled windows :

    i.   Tiled windows, illustrated in Fig. 4.3.1, derive their name from common floor or wall tile.
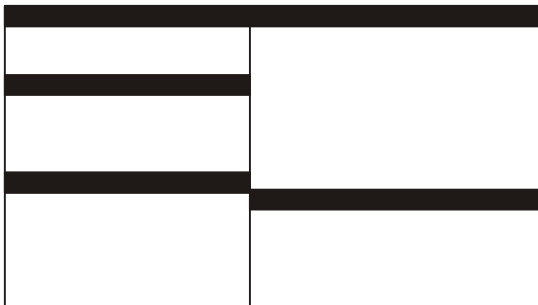
Fig. 4.3.1. Tiled windows.

ii. Tiled windows appear in one plane on the screen and expand or contract to fill up the display surface, as needed.

iii. Most systems provide two-dimensional tiled windows, adjustable in both height and width.

iv. Some less-powerful systems, however, are only one-dimensional, the windows being adjustable in only one manner.

2. Overlapping windows :

i. Overlapping windows, illustrated in Fig. 4.3.2, may be placed on top of one another like papers on a desk.
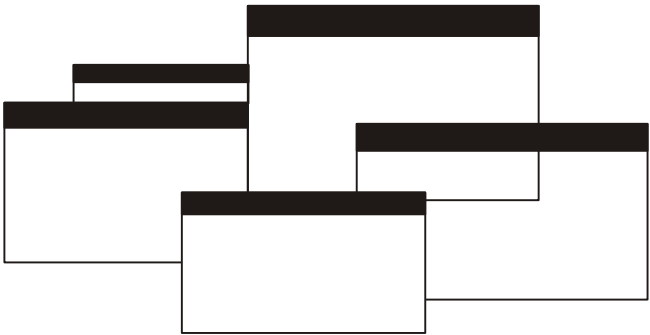
Fig. 4.3.2. Overlapping windows.

ii. They possess a three-dimensional quality, appearing to lie on different planes.

iii. Users can control the location of these windows, as well as the plane in which they appear.

iv. The sizes of some types of windows may also be changed. Most systems today normally use this style of window.

Que 4.4. **What are the advantages of tiled window and overlapping window ?**

Answer

Tiled windows :

Advantages include the following :

1. The system usually allocates and positions windows for the user, eliminating the necessity to make positioning decisions.

2. Open windows are always visible, eliminating the possibility of them being lost and forgotten.

3. Every window is always completely visible, eliminating the possibility of information being hidden.

4. They are perceived as less complex than overlapping windows, possibly because there are fewer management operations.

5. They are easier, according to studies, for novice or inexperienced people to learn and use.

6. They yield better user performance for tasks where the data requires little window manipulation to complete the task.

Disadvantages include the following :

1. Only a limited number can be displayed in the screen area available.

2. As windows are opened or closed, existing windows change in size. This can be annoying.

3. As windows change in size or position, the movement can be disconcerting.

4. As the number of displayed windows increases, each window can get very tiny.

5. The changes in sizes and locations made by the system are difficult to predict.

6. The configuration of windows provided by the system may not meet the user's needs.

Overlapping windows :

Advantages include the following :

1. Visually, their look is three-dimensional, resembling the desktop that is familiar to the user.

2. Greater control allows the user to organize the windows to meet his or her needs.

3. Windows can maintain larger sizes.

4. Windows can maintain consistent sizes.

5. Windows can maintain consistent positions.

6. Screen space conservation is not a problem, because windows can be placed on top of one another.

7. There is less pressure to close or delete windows no longer needed.

Disadvantages include the following :

1. They are operationally much more complex than tiled windows. More control functions require greater user attention and manipulation.

2. Information in windows can be obscured behind other windows.

3. Windows themselves can be lost behind other windows and be presumed not to exist.

4. Overlapping windows represent a three-dimensional space is not always realized by the user.

5. Control freedom increases the possibility for greater visual complexity and crowding. Too many windows, or improper offsetting, can be visually overwhelming.

Que 4.5. | **What are the different types of windows ?**

Answer

Types of windows :

1. Primary window :

   i.   The primary window is the first one that appears on a screen when an activity or action is started.

   ii.   It is required for every function or application, possessing a menu bar and some basic action controls.

   iii. It should present the framework for the function's commands and data, and provide top-level context for dependent windows.

   iv.   It has also been variously referred to as the application window or the main window.

2. Secondary window :

   i.   Secondary windows are supplemental windows.

   ii.   Secondary windows may be dependent upon a primary window or displayed independently of the primary window.

   iii. A dependent secondary window is one common type. It can only be displayed from a command on the interface of its primary window.

   iv.   An independent secondary window can be opened independently of a primary window.

3. Dialog boxes :

   i.   Dialog boxes are used to extend and complete an interaction within a limited context.

   ii.   Dialog boxes are always displayed from another window, either primary or secondary, or another dialog box.

   iii. They may appear as a result of a command button being activated or a menu choice being selected, or they may be presented automatically by the system when a condition exists that requires the user's attention or additional input.

4. Property sheets and property inspectors :

   i.   The properties of an object in an interface can be displayed in a variety of ways.

   ii.   Secondary windows provide following two techniques for displaying properties :

   a. Property sheets :

   i.   A property sheet is the most common way to present an object's complete set of properties in a secondary window.

    ii. A property sheet is a modeless secondary window that displays the user-accessible properties of an object, properties that may be viewed but not necessarily edited.

b. Property inspector :

    i. Property inspector displays the property of an object by using a dynamic viewer or browser that reflects the properties of the current selection.

    ii. It is used for displaying only the most common or frequently accessed object properties. It makes changes dynamically.

5. Message boxes :

    i. A message box is a secondary window that displays a message about a particular situation or condition.

6. Palette windows :

    i. Palette windows are modeless secondary windows that present a set of controls.

    ii. Palette windows are distinguished by their visual appearance, a collection of images, colors or patterns.

    iii. The title bar for a palette window is shorter and includes only a close button.

7. Pop-up windows :

    i. Pop-up windows can be used to display additional information when an abbreviated form of the information is the main presentation technique.

    ii. Pop-up windows are also used to provide context-sensitive help information.

    iii. Pop-up windows do not contain standard secondary window components such as a title bar and close button.

Que 4.6. | **Explain different window management schemes.**

Answer

Microsoft windows provide following window management schemes :

1. Single-document interface :

    i. The window interface can be established using a single primary window.

    ii. A single-document window design is sufficient when the object's primary presentation or use is as a single unit, such as a folder or document, even when the object contains different types.

    iii. In a single-document window design, the primary window provides the primary view or work area.

iv. Secondary windows can be used for supplemental forms of input, and to view information about objects presented in the primary window.

2. Multiple-document interface :

i. A multiple-document interface (MDI) may be used when multiple views of an object, or multiple documents, must be looked at simultaneously.

ii. The purpose of this scheme of windows is to provide multiple views of the same object, to permit comparisons among related objects, and to present multiple parts of an application.

iii. An MDI interface consists of multiple document windows that are easy to move between, essentially primary windows constrained to appear only within the parent windows boundary (instead of on the desktop).

3. Workbooks :

i. A workbook is a scheme for managing a set of views that uses the metaphor of a book or notebook.

ii. Within the workbook, views of objects, in the form of sections, are presented within the workbook's primary window, rather than in individual child windows.

iii. Tabs are used as a navigational interface to move between different sections.

iv. Each tabbed section represents a view of data. One section can be used to list the workbook's table of contents.

4. Projects :

i. A project is similar to a multiple-document interface (MDI), but does not visually contain the child windows.

ii. Objects represented by icons contained within it can be opened into primary windows that are peers with the parent window.

iii. Opened peer windows in the project do not share the menu bar or other areas contained with the parent window.

iv. Each opened peer window within the project must possess its own menu bar and other interface elements.

Que 4.7. | **Describe the structure of menus.**

Answer

Structures of menus :

1. Single menus :

i. In this simplest form of menu, a single screen or window is presented to seek the user's input or request an action to be performed.

ii. Single menus conceptually require choices from this single menu only, and no other menus will follow necessitating additional user choices.

iii. The user need only consider the immediate consequences of the item being chosen and need not be concerned with any other additional system menus.

2. Sequential linear menus :

i. Sequential linear menus are presented on a series of screens possessing only one path.

ii. The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.

iii. The length of the path may be short, or long, depending upon the nature of the information being collected.

iv. All the menus are important to the process at hand and must be answered in some manner by the user.

3. Simultaneous menus :

i. Instead of being presented on separate screens, all menu options are available simultaneously.

ii. The menu may be completed in the order desired by the user, choices being skipped and returned to later.

iii. All alternatives are visible for reminding of choices, comparing choices, and changing answers.

iv. The medium associated with a long series of sequential menus is greatly reduced.

4. Hierarchical menus :

i. A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, from options, to sub-options, from categories to sub-categories, and so on.

ii. A hierarchical structure can best be represented as an inverse tree, leading to more and more branches as one move downward through it.

iii. Hierarchical structures are characterized by depth and breadth, depth being the number of choice levels one must traverse to reach the destination, breadth being the number of alternatives found at each level.

5. Connected menus :

i. Connected menus are networks of menus all interconnected in some manner.

ii. Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.

   iii. A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction.

6. Event-trapping menus :

   i. Event-trapping menus provide an ever-present background of control over the system's state and parameters while the user is working on a foreground task.

   ii. They are, in essence, a set of simultaneous menus imposed on hierarchical menus.

   iii. Event-trapping menus generally serve one of three functions :

      1. They may immediately change some parameter in the current environment (bold a piece of text).

      2. They may take the user out of the current environment to perform a function without leaving the current environment (perform a spell check).

      3. They may exit the current environment and allow the user to move to a totally new environment (Exit).

Que 4.8. | **Discuss the functions of menus.**

Answer

From the user's perspective, a menu can be used to perform several functions :

1. Navigation to a new menu :

   i. Each user selection causes another menu in a hierarchical menu tree to be displayed.

   ii. The purpose of each selection is to steer the user toward an objective or goal.

   iii. Selection errors may lead the user down wrong paths, and cost time and, perhaps, aggravation, but these errors are non-destructive and usually undoable.

2. Execute an action or procedure :

   i. A user selection directs the computer to implement an action or perform a procedure.

   ii. The action may be something like opening or closing a file, copying text, or sending a message.

   iii. In some cases execution may only occur after a hierarchical menu tree is navigated.

   iv. In other cases actions may be performed as successive hierarchical menus are encountered and traversed.

   v. Selection errors may or may not have serious consequences, depending upon the nature of the action.

vi. Accidental selection of critical irreversible actions must be prevented in interface design.

3. Displaying information :

i. The main purpose of selecting a menu choice may simply be to display information.

ii. The user may be searching for specific information in a database or browsing the Web.

iii. The user's focus is primarily on the information desired and less on the selection function.

iv. Users may spend considerable time and effort understanding and processing uncovered information in order to evaluate subsequently displayed menu choices.

v. Wrong turns in the process will again cost time and perhaps aggravation, but these errors are non-destructive and usually undoable.

4. Data or parameter input :

i. Each selection specifies a piece of input data for the system or provides a parameter value.

ii. Data or values may be input on a single menu or spread over a hierarchy of menus.

iii. The user's focus is primarily on the information being provided and, again, less on the selection function.

iv. Selection errors can easily be corrected if detected by the system.

Que 4.9. | **What are website navigation problems ?**

Answer

Website navigation problems :

1. Technical issues :

i. Unlike a graphical system application, whose screens tend to flow in an orderly and predictable manner, a web application is composed of pages, each of which can, theoretically, be linked to any other page in the application.

ii. The graphical application user normally begins a process at a prescribed starting point and proceeds sequentially until a process or task is finished.

iii. Web users can perform tasks or satisfy needs at will, easily moving between most screens in the application "spider web" in any order desired, and even jumping to other spider webs when the urge arises.

2.   Usage problems :

i.   The two most serious user problems in web navigation are the heavy mental loads imposed to use the web and the feeling of spatial disorientation that often occurs.

ii.   The cognitive or mental overhead the user must expend in making decisions concerning which links to follow, or to abandon, can be overwhelming.

iii.   Often, there are too many links presented on a page, many of whose meanings are not clear.

iv.   Links frequently offer few clues to where they lead, how much information will be found at the other end, and how this information relates to the currently displayed page.

v.   For the user to reach a goal, each link's relevance to the task at hand must be determined.

PART-2

Selection of Device-Based and Screen-Based Controls.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.10. **What are the various task performed by device-based controls.**

Answer

Various task performed by device-based controls :

i.   To point at an object on the screen.

ii.   To select the object or identify it as the focus of attention.

iii.   To drag an object across the screen.

iv.   To draw something free form on the screen.

v.   To track or follow a moving object.

vi.   To orient or position an object.

vii.   To enter or manipulate data or information

Que 4.11. **Discuss various device based controls.**

Answer

Various device-based controls :

1. Trackball :

    i.   Trackball is a ball that rotates freely in all directions in its socket.

    ii.   The ball is rotated with one's fingertips, and its direction and speed are tracked and translated into equivalent screen cursor movement.

    iii.   Trackballs are well suited for navigational control, as in video games or exploration of 3-D environments.

    iv.   In these tasks, smooth movement is more important than fine target acquisition.

2. Joystick :

    i.   A joystick, like its aircraft namesake, is a stick or bat-shaped device usually anchored at the bottom.

    ii.   They come in variable sizes, smaller ones being operated by fingers, larger ones requiring the whole hand.

    iii.   The smaller joysticks require fine motor coordination, the larger ones more gross coordination.

    iv.   Some, called force joysticks, are immovable, responding to pressure exerted against them.

    v.   Others, called movable joysticks, can be moved within a dish-shaped area.

    vi.   Some kinds of joysticks permit continuous movements, others only horizontal and vertical movements.

    vii.   Joysticks may also be mounted on the keyboard.

    viii.   Joysticks are also well suited for navigational control where smooth movement is most important.

3. Graphic tablet :

    i.   Graphic tablet, also called a touch tablet, is a device with a horizontal surface sensitive to pressure, heat, light, or the blockage of light.

    ii.   It may lie on the desk or may be incorporated on a keyboard, and it is operated with fingers, light pen, or objects like a pencil or stylus.

    iii.   The screen pointer imitates movement on the tablet.

4. Light pen : A light pen also utilizes a touch screen, but one that is sensitive in a specific way to one kind of pen or stylus.

5. Touch screen :

    i.   A touch screen is a screen that consists of a special surface sensitive to finger or stylus touch.

    ii.   Objects on the screen are pointed to and touched to select them.

6. Voice :

   i.   Automatic speech recognition technology has been under development for more than a quarter of a century.

7. Mouse :

   i.   A mouse is a rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.

   ii.   The movement of the screen pointer mimics the mouse movement.

Que 4.12. | **What are the advantages and disadvantages of :**

i. Trackball   **ii. Joystick**
iii. Graphic tablet   **iv. Touch screen**

Answer

i. Trackball :

Advantages :

1. Direct relationship between hand and pointer movement in terms of direction and speed.

2. Does not obscure vision of screen.

3. Does not require additional desk space (if mounted on keyboard).

Disadvantages :

1. Movement is indirect, in a plane different from the screen.

2. No direct relationship exists between hand and pointer movement in terms of distance.

3. Requires a degree of eye-hand coordination.

4. Requires hand to be removed from keyboard keys.

5. Requires different hand movements.

6. Requires hand to be removed from keyboard (if not mounted on keyboard).

ii. Joystick :

Advantages :

1. Direct relationship between hand and pointer movement in terms of direction.

2. Does not obscure vision of screen.

3. Does not require additional desk space (if mounted on keyboard).

Disadvantages :

1. Movement indirect, in plane different from screen.

2. Indirect relationship between hand and pointer in terms of speed and distance.

3. Requires a degree of eye-hand coordination.

4. It may be slow and inaccurate.

5. Requires different hand movements to use.

6. Requires hand to be removed from keyboard (if not mounted on keyboard).

iii. Graphic tablet :

Advantages :

1. Direct relationship between touch movements and pointer movements in terms of direction, distance, and speed.

2. More comfortable horizontal operating plane.

3. Does not obscure vision of screen.

Disadvantages :

1. Movement is indirect, in a plane different from screen.

2. Requires hand to be removed from keyboard.

3. Requires hand to be removed from keyboard keys.

4. Requires different hand movements to use.

5. Requires additional desk space.

6. Finger may be too large for accuracy with small objects

iv. Touch screen :

Advantages :

1. Direct relationship between hand and pointer location in terms of direction, distance, and speed.

2. Movement is direct, in the same plane as screen.

3. Requires no additional desk space.

4. Stands up well in high-use environments.

Disadvantages :

1. Finger may obscure part of screen.

2. Finger may be too large for accuracy with small objects.

3. Requires moving the hand far from the keyboard to use.

4. Very fatiguing to use for extended period of time.

5. May soil or damage the screen.

Que 4.13. Discuss the findings to select the proper device-based controls.

Answer

Significant findings to select the proper device-based controls include the following :

Keyboard versus mouse :

i. Typists prefer a keyboard to a mouse because of speed.

ii. An experienced typist, through kinesthetic memory, has memorized the location of keyboard keys.

iii. The keying process becomes exceptionally fast and well learned.

iv. The mouse is slower, and it has a tendency to move about the desk. Its location cannot be memorized.

v. The keyboard keys always remain in the same spot.

Control research : A survey of the research literature comparing and evaluating different devices yields the following summarization concerning tasks involving pointing and dragging :

i. The fastest tools for pointing at stationary targets on screens are the devices that permit direct pointing: the touch screen and light pen.

ii. In terms of positioning speed and accuracy for stationary targets, the indirect pointing devices-the mouse, trackball, and graphic tablet, do not differ greatly from one another.

iii. A separate confirmation action that must follow pointer positioning increases pointing accuracy but reduces speed. The mouse offers a very effective design configuration for tasks requiring this confirmation.

iv. For tracking small, slowly moving targets, the mouse, trackball, and graphic tablet are preferred to the touch screen and light pen because the latter may obscure the user's view of the target.

Que 4.14. **Discuss the guidelines for selecting proper device-based controls.**

Answer

Guidelines for selecting the proper device-based control :

1. Task characteristics :

i. Keyboards (cursor control keys) are usually faster when moving through structured arrays consisting of a few discrete objects.

ii. For graphical and drawing tasks, alternative pointing devices are easier and faster. Use a mouse, joystick, trackball, or graphic tablet for pointing, selecting, drawing, dragging, or tracking.

iii. Provide touch screens when the opportunity for training is minimal; targets are large, discrete, and spread out; frequency of use is low; desk space is at a premium; and little or no text input requirement exists.

2. User characteristics and preferences :

i. Provide keyboards for touch typists.

ii. While preferences do not always correspond to performance, it is important that the user be comfortable with the selected device.

3. Environmental characteristics :

   i. The device should fit easily into the work environment.

   ii. If desk space is necessary, does it exist and is it large enough.

4. Hardware characteristics :

   i. Is the device itself of a quality that permits easy performance of all the necessary tasks.

   ii. Joysticks, for example, are quite variable in their movement capabilities.

Que 4.15. | **What are selection controls ?**

Answer

Selection controls :

a. A selection control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value.

b. The relevant item or items are selected from those displayed.

c. Selection controls include :

   1. Radio buttons :

     i. Controls of this type take several different physical forms.

     ii. They are most often called radio buttons because of their resemblance to similar controls on radios.

     iii. Microsoft Windows, however, refers to these controls as option buttons.

     iv. One common display method consists of a circle associated with each choice description.

   2. Check boxes :

     i. Check boxes, too, may take different physical forms and be called by different names.

     ii. The most common name is check boxes, the name used by Microsoft Windows. Others names include: toggle buttons, switches, and two state non-exclusive settings.

     iii. Not only their names differ; differences also exist in the way these fields are presented on screens.

   3. List boxes :

     i. List box is a permanently displayed rectangular box control that contains a list of values or attributes from which single or multiple selections are made.

     ii. It can also be referred to as a fixed list box because it is fixed on the screen.

4. Drop-down/pop-up list boxes :

i.   A drop-down/pop-up list box is a single rectangular field with a small button to the side and an associated hidden list of options.

ii. The button provides a visual cue to the user that an associated selection box of choices is hidden but available on demand.

iii. When requested, a larger associated rectangular box appears containing a scrollable list of choices from which one is selected.

iv. Selections are made by using the mouse to point and click.

5. Palettes :

i.   Like radio buttons, palettes can also be used to present two or more mutually exclusive alternatives.

ii. The choices presented, however, are visually descriptive within themselves, no choice descriptions being needed to identify them.

iii. Examples of palettes might be fill-in colors, patterns, or different shades of a color.

iv. A palette may also be referred to as value set or well.

v.   In addition to being a standard screen control, a palette may also be presented on a pull-down or pop-up menu, included in a toolbar, or be contained in a palette window.

Que 4.16. Describe the various operable controls.

Answer

Operable controls : Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed.

Some operable controls are as follows :

1. Buttons :

i.   Button are most often rectangular, with text that indicates the action to be taken when they are selected or pressed.

ii. These buttons are usually placed within a window, and activating them causes the action or command described on them to be performed immediately.

2. Text entry/read-only controls :

i.   A text entry/read-only control contains text that is exclusively entered or modified through the keyboard.

ii. It may also contain entered text being presented for reading or display purposes only.

3. Selection controls :

i. A selection control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value.

ii. The relevant item or items are selected from those displayed.

iii. Some selection controls require an action to retrieve the entire listing and/ or scrolling to view all the alternatives.

iv. Selection controls include radio buttons, check boxes, list boxes, drop-down/pop-up list boxes, and palettes.

4. Combination entry / selection controls :

i. It is possible for a control to possess the characteristics of both a text field and a selection field.

ii. In this type of control, information may either be keyed into the field or selected and placed within it.

iii. The types of combination entry/selection fields are spin boxes, attached combination boxes, and drop-down/pop-up combination boxes.

PART-3

Components, Text and Messages.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.17. **What is text ? How we present and write text ?**

Answer

1. Text is any textual element that appears on a screen, including field captions, headings, words, sentences, messages, and instructions.

2. Text refers to body text, a large compilation of words whose smallest element is a paragraph and whose maximum length is unlimited, its size being governed by the reason for its existence.

Presenting text :

1. Fonts :

a. Use plain and simple fonts.

b. Choose a minimum point size of 12 to 14.

c. Use proportional fonts.

2. Width :

   a. Include not more than 40 to 60 characters on each line. A double column of 30 to 35 characters separated by five spaces is also acceptable.

   b. Do not right-justify.

   c. Do not hyphenate words.

3. Content :

   a. Use headings to introduce a new topic.

   b. Separate paragraphs by at least one blank line.

   c. Start a fresh topic on a new page.

   d. Use lists to present facts.

4. Emphasize important things by :

   a. Positioning

   b. Boxes

   c. Bold typefaces

   d. Indented margins

5. Miscellaneous :

   a. Use paging (not scrolling).

   b. Provide a screen design philosophy consistent with other parts of the system.

Writing text :

1. Sentences and paragraphs :

   a. Use short sentences composed of familiar, personal words.

      i. Cut the excess words.

      ii. Try to keep the number of words in a sentence to 20 or less.

   b. Cut the number of sentences.

   c. Use separate sentences for separate ideas.

   d. Keep the paragraphs short.

   e. Restrict a paragraph to only one idea.

2. Style :

   a. Use the active writing style.

   b. Use the personal writing style, if appropriate.

   c. Write as you talk.

   d. Use subjective opinion.

   e. Use specific examples.

   f. Read it out loud.

Que 4.18. | **Discuss text for web pages.**

Answer

Text for web pages :

1. Text for Web pages follow the aforementioned guidelines (Refer Q. 4.17) for words, sentences, messages, instructions, and text.

2. The unique characteristics of the web, require a separate set of supplemental guidelines for several Web topics, including, word usage, error message presentation, and text, heading, and title writing.

Words : Minimize the use of words that call attention to the Web.

Error messages :

1. Provide helpful error messages for :
   a. Incomplete or incorrectly keyed, entered, or selected data.
   b. Requests for documents that do not exist or cannot be found.

2. Redisplay a message on the page to which it relates.

3. Present them in a visually distinctive and noticeable manner.

Instructions :

1. Do not use phrasing that indicates a certain page order or flow.

2. Phrase them in a browser-independent manner.

3. Minimize "Click here" instructions.
   a. Say "Select this link."

Que 4.19. | **Write a short note on message.**

Answer

i.   Messages are communications provided on the screen to the screen viewer.

ii. Several different types of messages exist, and they may be displayed in different forms and locations.

iii. A message should possess the proper tone and style and be consistent within itself and with other messages.

iv. Screen messages fall into two broad categories :

   1. System messages are generated by the system to keep the user informed of the system's state and activities. They are customarily presented within message boxes. They reflect the system state, as it exists at that moment in time.

   2. Instructional messages, sometimes referred to as prompting messages, are messages that tell the user how to work with, or complete, the screen displayed. They may be provided in messages boxes and also within the screen itself.

Common message types are :

1. Status messages :

i. A status message is used for providing information concerning the progress of a lengthy operation.

ii. It usually contains a progress indicator and a short message describing the kind of operation being performed.

iii. It typically only possesses a Cancel button, to stop the operation being performed.

iv. Pause and resume buttons may also be included, if desired.

2. Informational messages :

i. Informational messages, also called notification messages, provide information about the state of the system when it is not immediately obvious to the user.

ii. They may confirm that non-obvious processing is taking place or is completed.

iii. They may also be used to provide intermediate feedback when normal feedback is delayed.

iv. This kind of message is usually identified by an "I" icon to the left of the message.

3. Warning messages :

i. Warning messages call attention to a situation that may be undesirable.

ii. They are usually identified by an "!" icon to the left of the message.

iii. The user must determine whether the situation is in fact a problem and may be asked to advise the system whether or not to proceed.

iv. A deletion request by a user is an action that commonly generates a warning message.

4. Critical messages :

i. Critical messages, sometimes called action messages, call attention to conditions that require a user action before the system can proceed.

ii. A message describing an erroneous situation is usually presented as a critical message.

iii. Some inconsistency currently exists in the icons used to designate this kind of message.

5. Question messages :

i. Question messages are another kind of message type sometimes seen.

ii. A question message asks a question and offers a choice of options for selection.

iii. It is designated by a "?" icon preceding the message text.

iv. This type may be used when there is a question to be asked and the message does not appear to be suited to the above types.

Que 4.20. **What are the message box guidelines recommended by Microsoft ?**

Answer

Microsoft recommends following message box guidelines :

1. **Title bar text :**

   i. Clearly identify the source of the message in the message box title bar.

   ii. This may be the name of the object to which it refers, or the name of the application to which it refers.

   iii. A clear title is particularly important in the Windows multitasking environment because message boxes that appear might not always be the result of current user interaction.

   iv. In addition, because objects supported by different applications can be embedded in the same document, different application code may be running when the user activates the object for editing.

   v. Therefore, the title of a message box plays a vital role in communicating the source of a message.

2. **Message box text :**

   i. It provides a clear and concise description of the condition causing the message box to be displayed, in terminology the user understands.

   ii. It uses complete sentences with ending punctuation.

   iii. To aid user comprehension, avoid contractions, technical jargon, and system-oriented information.

   iv. Provide only as much background information as necessary for the message to be understood.

   v. To supplement the amount of information in the message box text, include a help button to access more complete descriptive information.

Que 4.21. **Discuss message box controls.**

Answer

Message box controls :

1. **Command buttons :**

   i. A user response to a message box is usually accomplished though a command button.

ii.   The kind, or kinds, of command buttons included depend upon the reason the message box was presented.

iii. If a message requires no user choices to be made but only an acknowledgment of the message, include an OK button.

iv.   If the message requires the user to make a choice, include a command button for each option.

v.   Include OK and Cancel buttons only when the user has the option of continuing or stopping the action.

vi.   Use Yes and No buttons when the user must decide how to continue.

vii. If these choices are too ambiguous, label the command buttons with the names of specific actions to be performed, Save and Delete for example.

2. Close box :

i.   Enable the title bar Close box only if the message includes a Cancel button.

Que 4.22. | Discuss instructional message in detail.

Answer

Instructional messages : Instructional or prompting messages, are guidance messages that tell the user how to work with, or complete, the screen displayed. They may be permanently affixed to a screen, or they may appear as the result of a help request.

1. Depth of detail :

i.   Instructional messages are of most benefit to the novice or casual system user.

ii.   Instructions for these kinds of users must be more detailed than for experienced users. Experienced users usually require only cryptic reminders.

iii. To balance the needs of a wide range of users with varying experience levels, accessing instructions through a Help function is the best solution.

2. Location :

i.   Locate instructions at strategic points on screens.

ii.   They should be placed at spots just preceding the controls or elements to which they apply.

iii. Never place an instruction on one screen that applies to elements on a following screen. They will not be remembered.

3. Visual differentiation :

i.   Display instructions in a manner that visually differentiates them from all other screen elements.

ii. This will allow them to be easily ignored by users who do not need them.

4. Writing : In writing instructions, follow all relevant writing guidelines recently described for words, sentences, and messages.

PART-4

Icons and Increases, Multimedia.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.23. **What is icon ? Write down the characteristics of icons.**

Answer

a. Icons are most often used to represent objects and actions with which users can interact with or that they can manipulate.

b. These types of icons may stand alone on a desktop or in a window, or be grouped together in a toolbar.

c. A secondary use of an icon is to reinforce important information, a warning icon in a dialog message box.

Characteristics of icons :

1. Clarity :

i. Screen resolution should be sufficiently fine to establish clear differences of form at the normal working distance.

ii. The resolution and pixel shapes for screens differ from one another.

iii. Icons must appear correctly and consistently no matter what kind of screen is used.

iv. If color is used, it should contrast well with the background.

v. Poor clarity will lead to identification errors and slower performance.

2. Simplicity :

i. Icons used in graphical user interface must be simple.

ii. Too many parts in the icons will only confuse the screen viewer.

3. Consistency :

i. Are families of icons consistent in structure and shape ?

ii. Are the same icons displayed on different screens consistent in shape and structure ?

iii. Are the same icons displayed in different sizes also consistent in structure and shape ?

4. Directness :

i.   For concrete objects and actions, direct links are more easily established.

ii. However, adjectives, adverbs, conjunctions, and prepositions can cause problems.

iii. Also, how does one easily convey concepts such as bigger, smaller, wider, or narrower ?

5. Efficiency :

i.   In some situations, a graphics screen may be less efficient, consuming more screen display space than a word or requiring more physical actions by the user than text.

ii. A telephone directory of 50 names and numbers listed on an alphanumeric screen may consume the same screen space required for, and manipulation of, 15 file cards.

iii. Raising an arm or moving a mouse may be slower than simply typing.

iv. In other situations, icons can be more effective than words in communicating concepts in a smaller area of space.

v.   Icons' strength lies in situations where this occurs.

Que 4.24. | **Explain design process for icons.**

Answer

The design process :

1. Define purpose :

i.   To begin the design process, first define the icon's purpose and use.

ii. Have the design team brainstorm about possible ideas, considering real-world metaphors.

iii. Simple metaphors, analogies, or models with a minimal set of concepts are the best places to start in developing icons.

2. Collect, evaluate, and sketch ideas :

i.   Start by designing on paper, not on the computer.

ii. Ask everyone to sketch his or her ideas.

iii. Do not worry about too much detail; exact pixel requirements are not necessary at this time.

3. Draw in black and white :

i.   Many icons will be displayed in monochrome.

ii. Color is an enhancing property; consider it as such.

4.   Test for expectation, recognition, and learning :

i.   Choosing the objects and actions, and the icons to represent them, is not a precise process, and will not be easy.

ii. So, as in any screen design activity, adequate testing and possible refinement of developed images must be built into the design process.

iii. Icon recognition and learning should both be measured as part of the normal testing process.

5.   Test for legibility :

i.   Verify the legibility and clarity of the icons in general. Also, verify the legibility of the icons on the screen backgrounds chosen.

ii. White or gray backgrounds may create difficulties.

iii. An icon mapped in color, then displayed on a monochrome screen, may not present itself satisfactorily.

iv. Be prepared to redraw it in black and white, if necessary.

6.   Register new icons in the systems registry :

i.   Create and maintain a registry of all system icons.

ii. Provide a detailed and distinctive description of all new icons.

Que 4.25. | **Describe icon animation and audition.**

Answer

Icon animation and audition :

Animation :

1.   An animated icon appears to move instead of maintaining a static position on the screen.

2.   Animation can take two forms, best described as static and dynamic :

   a.   Static :

   i.   A static icon's appearance is unchanged over a period of time and changes only at the moment that a system event occurs.

   ii. An example would be the open door of a mailbox shutting when an electronic message is received.

   b.   Dynamic :

   i.   A dynamic icon's movement is independent of a system event, changing appearance to represent functions, processes, states, and state transitions.

   ii. An example is an icon that begins movement to illustrate an action when a pointer is moved close to it.

3.   Animation can be used to provide feedback and to create visual interest.

Audition :

1. Objects make sounds as they are touched, dragged, bumped against one another, opened, activated, and thrown away.

2. Auditory icons are computer sounds replicating everyday sound-producing events.

3. When a printer near one's desk begins printing, the sound of the printing mechanism is heard. This provides auditory feedback that a print operation one has just asked for has successfully started.

4. An auditory icon would be the same sound, generated by the computer.

5. Another example would be to convey information about an object's dimensions. If a file is large, it can sound large. If an object is dragged over a new surface, the new surface is heard. If an ongoing process starts running more quickly, it sounds quicker.

6. Sounds can convey information about many events in computer systems, permitting people to listen to computers as we do in the everyday world.

7. It may be well suited to providing information :

   a. About previous and possible interactions.

   b. Indicating ongoing processes and modes.

   c. Useful for navigation.

   d. To support collaboration.

Que 4.26. Describe multimedia in detail.

Answer

1. Multimedia can hold the user's attention, add interest to a screen, entertain, and quickly convey information that is more difficult to present textually.

2. It can also make the Web much more accessible to people with disabilities.

3. On the other hand, effective use of multimedia in design has been hindered by a lack of knowledge concerning how the various media may best be used, and a scarcity of applied design guidelines.

1. Graphics :

i. Graphics supplement the textual content, not as a substitute for it.

ii. They convey information that can not be effectively accomplished using text.

iii. Graphics contained in Web pages serve several distinct purposes, which can be classified as follows :

   a. Navigational : To identify links that may be followed.

   b. Representational : To illustrate items mentioned in the text.

    c. Organizational : To depict relationships among items mentioned in text.

    d. Explanative : To show how things or processes work.

    e. Decorative : To provide visual appeal and emphasis.

2. Images :

    i. Standard images :

      a. Whenever possible, use standard images that have already been developed and tested.

      b. This will promote consistency across systems, yielding all the performance benefits that consistency provides.

      c. These standard images may be found in guideline books, company or organizational documentation, or in industry, trade, or standards organizations documentation.

    ii. Consistency :

      a. Use an image consistently throughout an application or Web site.

      b. Multiple images with the same meaning will be difficult to learn.

    iii. Legibility :

      a. Create legible images, images that are easy to identify from a variety of viewing distances and angles.

      b. Legibility is affected by a number of factors, including contrast with the background, image complexity, and image size.

    iv. Descriptive text or labels :

      a. Many images are not immediately clear, even if well designed.

      b. The ability to comprehend, learn, and recall an image's meaning, especially if it is used for navigation, can be greatly improved by providing images with descriptive text or labels.

    v. Minimize number of images :

      a. The more images presented on a Web page, the slower the download time. Use text whenever possible.

    vi. Minimize size of images :

      a. Oversized images also take a long time to load.

      b. Slow loading graphics rarely add value to text, and people often don't bother to stick around for them.

      c. The design goal is to produce images that load quickly.

3. Video :

    a. Video is especially suited to showing things that move or change over time.

    b. Examples include product demonstrations, how to repair a piece of equipment, or how to perform a dance step.

c. Videos can also be used to present personal messages, although the speaker's "presence" may not always have the desired emotional effect.

d. Because of their animation, videos can also be used to grab attention.

PART-5

Colors, Uses, Problems, Choosing Colors.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.27. | **What is color ?**

Answer

1. To describe a color, it is useful to refer to the three properties it possesses :

   a. Hue :

   i. Hue is the spectral wavelength composition of a color. It is to this we attach a meaning such as green or red.

   b. Chroma :

   i. Chroma or saturation is the purity of a color in a scale from gray to the most vivid version of the color.

   ii. The more saturated a hue is, the more visible it is at a distance. The less saturated, the less visible it is.

   c. Value of intensity :

   i. Value or intensity is the relative lightness or darkness of a color in a range from black to white.

2. Two-word descriptors, such as light red or dark blue, are usually used to describe lightness differences.

3. Some hues are inherently lighter or darker than others, for example, yellow is very light and violet is very dark.

4. The primary colors of illuminated light are red, green, and blue, whose wavelengths additively combine in pairs to produce magenta, cyan, and yellow, and all the other visible colors in the spectrum.

5. The three primary colors additively combine to produce white.

6. The long wavelength colors (red) are commonly referred to as warm and short wavelength colors (blue) as cool.

7. Therefore, color is a combination of hue, chroma, and value.

Que 4.28. **What are the uses of color ?**

Answer

Use of color :

1. Use color to assist in formatting a screen :

    a. Relating or tying elements into groupings.

    b. Breaking apart separate groupings of information.

    c. Associating information that is widely separated on the screen.

    d. Highlighting or calling attention to important information by setting it off from the other information.

2. Use color as a visual code to identify :

    a. Screen components.

    b. The logical structure of ideas, processes, or sequences.

    c. Sources of information.

    d. Status of information.

3. Use color to :

    a. Realistically portray natural objects.

    b. Increase screen appeal.

Que 4.29. **What are the problems related to color ?**

Answer

Possible problems related to color are :

1. High attention-getting capacity :

    a. Color has an extremely high attention-getting capacity.

    b. This quality causes the screen viewer to associate, or tie together, screen elements of the same color, whether or not such an association should be made.

2. Interference with use of other screens :

    a. Indiscriminate or poor use of color on some screens will diminish the effectiveness of color on other screens.

    b. The rationale for color will be difficult to understand and its attention-getting capacity severely restricted.

3. Varying sensitivity of the eye to different colors :

    a. All colors are not equal in the eye of the viewer.

    b. The eye is more sensitive to those in the middle of the visual spectrum (yellow and green), which appear brighter than those at the extremes (blue and red).

c.   Thus, text composed of colors at the extremes is thought to be more difficult to read.

4.   Color-viewing deficiencies :

a.   Another disadvantage of color is that about 8 percent of males and 0.4 percent of females have some form of color-perception deficiency called color blindness.

b.   In actuality, very few people are truly color-blind; most of those with problems simply have difficulties discriminating certain colors.

c.   A red viewing deficiency is called protanopia, a green deficiency is called deuteranopia, and a blue deficiency is called tritanopia.

5.   Cross-disciplinary and cross-cultural differences :

a.   Colors can have different meanings in different situations to different people.

b.   A color used in an unexpected way can cause confusion.

c.   An error signaled in green would contradict the expected association of red with stop or danger. The same color may also have a different connotation, depending upon its viewer.

d.   Differences in color connotations also exist between cultures.

e.   Incorrect use in a different culture may cause severe problems.

Que 4.30. | **How to choose color ?**

---

1.   When choosing colors for display, one must consider the following factors :

a.   The human visual system.

b.   The possible problems that the colors use may cause.

c.   The viewing environment in which the display is used.

d.   The task of the user.

e.   How the colors will be used.

f.   The hardware on which the colors will be displayed.

2.   The primary objective in using color is communication, to aid the transfer of information from the screen to the user.

3.   Choosing colors for categories of information requires a clear understanding of how the information will be used.

4.   If different parts of the screen are attended to separately, color-code the different parts to focus selective attention on each in turn.

5.   If decisions are made based on the status of certain types of information on the screen, color-code the types of status that the information may possess.

6. If screen searching is performed to locate information of a particular kind or quality, color-code these kinds or qualities for contrast.

7. If the sequence of information use is constrained or ordered, use color to identify the sequence.

8. If the information displayed on a screen is packed or crowded, use color to provide visual groupings.

9. Use color as a redundant screen code.

☺☺☺

5
UNIT

Software Tools

CONTENTS

PART-1

Software Tools : Specification Methods, Interface Building Tools.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.1. **What is software tool ? What are the commonly used tools in human computer interface ?**

Answer

A software tool is programmatic software used to create, maintain, or otherwise support other programs and applications. Some of the commonly used software tools in HCI are as follows :

1. **Specification methods :** The methods used to specify the GUI. These are lengthy and ambiguous methods, but easy to understand.

2. **Grammars :** These are written instructions or expressions that a program would understand. They provide confirmations for completeness and correctness.

3. **Transition diagram :** These are set of nodes and links that can be displayed in text, link frequency, state diagram, etc. They are difficult in evaluating usability, visibility, modularity and synchronization.

4. **Statecharts :** Chart methods developed for simultaneous user activities and external actions. They provide link-specification with interface building tools.

5. **Interface building tools :** Design methods that help in designing command languages, data-entry structures, and widgets.

6. **Interface mockup tools :** Tools to develop a quick sketch of GUI. For example, Visual Studio .Net, etc.

7. **Software engineering tools :** Extensive programming tools to provide user interface management system.

8. **Evaluation tools :** Tools to evaluate the correctness and completeness of programs.

Que 5.2. **Explain specification method.**

Answer

1. The default language used for specifications in any field is the designer's natural language, such as English, and the initial specifications are generally drawn up on a sketchpad or blackboard.

2. But natural-language specifications tend to be lengthy, vague, and ambiguous, and therefore often are difficult to prove correct, consistent, or complete.

3. Formal and semi-formal languages have proved their value in many areas, including mathematics, physics, circuit design, music, and even knitting.

4. Formal languages have a specified grammar, and effective procedures exist to determine whether a string adheres to the languages.

Various specification methods :

1. Grammars :

   i. Grammars are useful to specify textual commands or expressions that a program should understand.

   ii. They were necessary with older terminal-based interfaces and are still used on interactive systems that need powerful and extensible symbolic expressions.

   iii. Grammars are also useful to verify the validity of stereotypical computer forms filled in by users, such as telephone-book entries.

   iv. In computer programming, Backus-Naur form (BNF), also called Backus normal form, is often used to describe programming languages.

   v. High-level components are described by non-terminals, and specific strings are terminals.

2. Menu-selection and dialog-box trees :

   i. A menu-selection tree has a simple structure that guides designers and users alike, making it an excellent selection style for many applications.

   ii. Specification methods include online tools to help in the construction of menu trees and simple drawing tools that enable designers and users to see the entire tree at one time.

3. Transition diagram :

   i. Transition diagram has a set of nodes that represent system states and a set of links between the nodes that represent possible transitions.

   ii. Each link is labeled with the user action that selects that link and possible computer responses.

4. Statecharts :

   i. Statecharts have several virtues in specifying interfaces.

   ii. Because a grouping feature is offered through nested roundtangles repeated transitions can be factored out to the surrounding roundtangle. Extensions to statecharts-such as concurrency, external interrupt events, and user actions-are represented in logix's Statemate, which is a user-interface tool.

Que 5.3. **Describe interface building tools in detail.**

Answer

Interface building tools :
1. Specification methods are important for the design of components of a system, such as command languages, data-entry sequences, and widgets.
2. Screen-transition diagrams drawn or printed on paper are an excellent means of providing an overview of the system.
3. They allow user-interface architects, designers, managers, users, and software engineers to sit around a table, discuss the design, and prepare for the big job that lies ahead.
3. Paper-based designs are a great way to start, but the detailed specification of complete user interfaces requires software tools such as :

a. Interface mockup tools :
   i. User interface architects recognize that creating quick sketches is important during the early stages of design to explore multiple alternatives, to allow communication within the design team, and to convey to clients what the product will look like.
   ii. User interface mockups can be created with paper and pencil, word processors, or slide show presentation software (such as Microsoft PowerPoint or Apple Keynote).
   iii. Resourceful designers have also built user-interface prototypes with multimedia construction tools, such as Dreamweaver.
   iv. These programs can quickly generate animated or even interactive programs and be distributed via the Web.

b. Software engineering tools :
   i. Experienced programmers sometimes build user interfaces with general-purposes programming languages such as Java, C#, or C++, but this approach is giving way to using facilities that are specially tuned to user-interface development and web access.
   ii. Choosing among them is sometimes a complex and confusing task, due to the lack of uniform terminology used to describe the tools and their features.

c. The windowing system layer :
   i. Some platforms are too new to offer high level building tools, forcing the software engineer to work at a low level. Only some graphics resources such as icons, images, cursors, or fonts can be edited interactively at this level.
   ii. Although better tools are being created every day, new platforms are being created too. Interfaces for some mobile devices or cell phones should currently be done at the windowing system level.

d.   The GUI toolkit layer :

   i.   Most products provide user interface program libraries called GUI toolkits that offer common widgets, such as windows, scroll bars, pull-down or pop-up menus, data-entry fields, buttons, and dialog boxes.

   ii.   Programming languages with accompanying libraries are familiar to experienced programmers and afford great flexibility.

   iii. However, toolkits without interactive support can become complex and the programming environments for those, such as the Microsoft Windows Forms, Apple Macintosh Toolkit, and Unix X Toolkit (Xtk), require months of learning for programmers to gain proficiency.

   iv.   Even then, the burden in creating applications is great, and maintenance is difficult.

Que 5.4. | **What are the features of interface building tools ?**

Answer

Features of user interface building tools :

i.   User interface independence :

   1.   Separate interface design from internals
   2.   Enable multiple user interface strategies
   3.   Enable multiple platform support
   4.   Establish role of user interface architect
   5.   Enforce standards

ii.   Methodology and notation :

   1.   Develop design procedures
   2.   Find ways to talk about design
   3.   Create project management

iii. Rapid prototyping :

   1.   Try out ideas very early
   2.   Test, revise, test, revise
   3.   Engage end users, managers, and customers

iv.   Software support :

   1.   Increase productivity
   2.   Offer constraint and consistency checks
   3.   Facilitate team approaches
   4.   Ease maintenance

PART-2

Interaction Devices, Keyboard and Function Keys.

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Questions-Answers

Long Answer Type and Medium Answer Type Questions

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Que 5.5. | **Explain interaction devices.**

Answer

Several interactive devices are used for the human computer interaction. Some of them are known tools and some are recently developed or are a concept to be developed in the future.

1. Touchscreen :

   i.   Touchscreens is the method of allowing the user to point and select objects on the screen, but they are much more direct than the mouse, as they detect the presence of the user's finger, or a stylus, on the screen itself.

   ii.   They work in one of a number of different ways : by the finger (or stylus) interrupting a matrix of light beams, or by capacitance changes on a grid overlaying the screen, or by ultrasonic reflections.

   iii.   Because the user indicates exactly which item is required by pointing to it, no mapping is required and therefore this is a direct device.

   iv.   The touchscreen is very fast, and requires no specialized pointing device. It is especially good for selecting items from menus displayed on the screen.

2. Gesture recognition :

   i.   Gesture recognition is a subject in language technology that has the objective of understanding human movement via mathematical procedures.

   ii.   This new technology magnitudes an advanced association between human and computer where no mechanical devices are used.

   iii.   This new interactive device might terminate the old devices like keyboards and is also heavy on new devices like touch screens.

3. Speech recognition :

   i.   The technology of transcribing spoken phrases into written text is speech recognition.

   ii.   Such technologies can be used in advanced control of many devices such as switching on and off the electrical appliances.

   iii.   This HCI device help the user in hands free movement and keep the instruction based technology up to date with the users.

4. Keyboard :

i. A keyboard can be considered as a primitive device known to all of us.

ii. Keyboard uses an organization of keys/buttons that serves as a mechanical device for a computer. Each key in a keyboard corresponds to a single written symbol or character.

iii. This is the most effective and ancient interactive device between man and machine that has given ideas to develop many more interactive devices as well as has made advancements in itself such as soft screen keyboards for computers and mobile phones.

5. Response time :

i. Response time is the time taken by a device to respond to a request.

ii. The request can be anything from a database query to loading a web page.

iii. The response time is the sum of the service time and wait time. Transmission time becomes a part of the response time when the response has to travel over a network.

Que 5.6. | **Describe keyboard and function keys.**

Answer

Keyboards :

1. The keyboard is still one of the most common input devices in use today.

2. It is used for entering textual data and commands.

3. The vast majority of keyboards have a standardized layout, and are known by the first six letters of the top row of alphabetical keys, QWERTY.

4. The layout of the digits and letters on a QWERTY keyboard is fixed, but non-alphanumeric keys vary between keyboards.

5. The QWERTY arrangement of keys is not optimal for typing, however. The reason for the layout of the keyboard in this fashion can be traced back to the days of mechanical typewriters.

6. The electric typewriter and now the computer keyboard are not subject to the original mechanical constraints, but the QWERTY keyboard remains the dominant layout.

7. There is also a large investment in current keyboards, which would all have to be either replaced at great cost, or phased out, with the subsequent requirement for people to be proficient on both keyboards.

Function keys :

1. A function key is a key on the computer keyboard which can be programmed so as to cause an operating system program to perform certain actions.

2. The function keys are arranged at the top of our keyboard numbered across from F1 to F12 and are commonly referred to as F keys or FN keys.

3. The keys provide some interesting shortcuts for common computer functions that can be useful tools in everyday computing.

4. The keys are frequently used in combination with other keys such as the CTRL key, the ALT key, and the SHIFT key.

5. Some common uses for function keys in Windows :

   i.   F1 : Display help screen.

   ii. F2 : Highlight file or folder for renaming.

   iii. F3 : Open search tool.

   iv. Alt+F4 : Close the current window.

   v.   F5 : Refresh the contents of a window or webpage.

   vi. F8 : Boot Windows into safe mode by holding F8 during startup.

PART-3

Pointing Devices.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.7. | **Describe pointing devices and types of interaction tasks useful for pointing devices.**

Answer

Pointing devices are important for small devices and large wall displays that make keyboards impractical as input devices.

Pointing devices are useful for six types of interaction tasks :

1. **Select :** Users choose from a set of items. This technique is used for traditional menu selection, identification of a file in a directory, or marking, for example, a part in an automobile design.

2. **Position :** Users choose a point in a one, two, three, or higher dimensional space. Positioning may be used to create a drawing, to place a new window, or to drag a block of text in a figure.

3. **Orient :** Users choose a direction in a two-, three-, or higher-dimensional space. The direction may simply rotate a symbol on the screen, indicate a direction of motion, or control the operation of a robot arm or other device.

4.   Path : Users rapidly perform a series of positioning and orientation operations. The path may be realized as a curving line in a drawing program, a character to be recognized, or the instructions for a cloth-cutting or other type of machine.

5.   Quantify : Users specify a numeric value. The quantify task is usually a one-dimensional selection of integer or real values to set parameters, such as the page number in a document, the velocity of a ship, or the amplitude of a sound.

6.   Text : Users enter, move, and edit text in a two-dimensional space. The pointing device indicates the location of an insertion, deletion, or change. Beyond the simple manipulation of the text are more elaborate tasks, such as centering, setting margins and font sizes, highlighting (boldface or underscore), and page layout.

Que 5.8.   **What are the types of pointing devices ?**

Answer

Pointing devices can be grouped into :

i.   Direct control on the screen surface, such as the touchscreen or stylus, and

ii.   Indirect control away from the screen surface, such as the mouse, trackball, joystick, graphics tablet, or touchpad.

Direct control pointing devices :

1.   Lightpen : The lightpen is a device that enabled users to point to a spot on a screen and then press a button to perform a select, position, or other task.

2.   Touchscreen : Touchscreen is robust and does not require picking up an external device; instead, it allows users to make direct-control touches on the screen with a finger.

3.   Tablet PCs and mobile devices : Tablet PCs and mobile devices make it natural to point on the LCD surface, which can be held in the arm or hand, placed on a desk, or rested on the lap.

4.   Stylus : The stylus is an attractive device because it is familiar and comfortable for users, and users can guide the stylus tip to the desired location while keeping the whole context in view.

Indirect control pointing device :

1.   Mouse : The mouse is appealing because of its low cost and wide availability. The hand rests in a comfortable position, buttons on the mouse are easy to press, long motions can be done rapidly by moving the forearm, and positioning can be done precisely with small finger movements.

2.   Trackball : Trackball is a movable ball that mounted on top of the stationary device. The ball gives an advantage for good locations where a mouse cannot move around enough. It is widely use in design and manufacturing industries.

3. **Touchpad :** Touchpad are slightly same as touchscreen, but touchpad can be only use in their provided space, commonly square or rectangle in shape. It works by sliding the finger over their small flat surface, and tapping the finger on the surface to click an option. It widely use in laptops.

4. **Pointing stick :** Pointing stick is a pressure sensitive small nub used like a joystick. It is located between the keys on a laptop keyboard that allows the user to control the pointer by directing the stick with one finger. Commonly found in between 'G' and 'H' key, and also at below the spacebar.

PART-4

Speech Recognition, Digitization and Generation.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.9. | **Explain speech recognitions.**

Answer

For designers of human/computer interaction systems, speech and audio technologies have atleast five variations :

1 **Discrete-word recognition :**

   i. Discrete-word-recognition devices recognize individual words spoken by a specific person; they can work with 90 to 98% reliability for 100 to 10,000 word or larger vocabularies.

   ii. Speaker-dependent training, in which users repeat the full vocabulary once or twice, is a part of many systems. Such training yields higher accuracy than in speaker independent systems, but the elimination of training expands the scope of commercial applications.

   iii. Quiet environments, head-mounted microphones, and careful choice of vocabularies improve recognition rates in both cases.

2. **Continuous-speech recognition :**

   i. HAL's ability to understand the astronauts' spoken words and even to read their lips was an appealing fantasy, but the reality is more sobering.

   ii. Many research projects have pursued continuous-speech recognition, and widespread hope for commercially successful products flourished during the dot-com boom.

   iii. Consumers bought the heavily promoted products, but exaggerated promises led to much disappointment.

   iv. Speech dictation products work but error rates and error repair are serious problems.

   v. In addition, the cognitive burdens of dictation interfere with planning and sentence formation, often reducing the quality of documents when compared with typewritten composition.

3. Voice information systems :

   i. The appeal of the human voice as a source of information and as a basis for communication is strong.

   ii. Stored speech is commonly used to provide telephone-based information about tourist sites and government services, and for after-hours messages from organizations.

   iii. These voice information systems, often called Interactive Voice Response (IVR), can provide good customer service at low cost if proper development methods and metrics are used.

4 Speech generation :

   i. Speech generation is a successful technology with widespread application in consumer products and on telephones.

   ii. Inexpensive, compact, reliable systems using digitized speech segments (also called canned speech) have been used in automobile navigation systems, internet services utility-control rooms.

5. Non-speech auditory interfaces :

   i. In addition to speech, auditory outputs include individual audio tone and more complex information presentation by combinations of sound and music.

   ii. Research on more sophisticated presentations often refers to sonification, audiolization, or auditory interfaces.

   iii. Early teletypes included a bell tone to alert users that a message was coming or that paper had run out.

   iv. Later computer systems added a range of tones to indicate warnings or to acknowledge the completion of an action.

   v. Keyboards and mobile devices such as digital cameras are built with electronically generated sound feedback.

Que 5.10. | **Discuss speech digitization and generation.**

Answer

1. Speech generation and digitized speech segments are usually preferable when the messages are simple and short, deal with events in time, and require an immediate response.

2. Speech becomes advantageous to users when their visual channels are overloaded; when they must be free to move around or when the environment is too brightly lit, too poorly lit, subject to severe vibration, or otherwise unsuitable for visual displays.

3. Telephone-based voice information systems may mix digitized speech segments and speech generation to allow appropriate emotional tone and current information presentation.

4. Applications based on keypad selections and limited speech recognition includes banking applications (Fidelity Automated Service Telephone, or FAST), phone directories, and airline schedules (Indian Airlines Dial-AA- Flight).

5. The ubiquity of telephones makes these services attractive, but an increasing number of users prefer the speed of web-based visual inquiries.

PART-5

Image and Video Displays, Drivers.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.11. **Describe image and video displays.**

Answer

Image and video displays :

1. Visual display unit (VDU) has become the primary source of feedback to the user from the computer. Important features, of VDU are :

    i.   Rapid operation

    ii. Reasonable size

    iii. Reasonable resolution

    iv. Quiet operation

    v.   No paper waste

    vi. Relatively low cost

    vii. Reliability

    viii. Highlighting

    ix. Graphics and animation

2. For certain applications, monochrome displays are adequate and are attractive because of their low cost. Color displays can make video games,

educational simulations, CAD and many other applications more attractive and effective for users.

3. Display technologies include :

i. CRT :

1. CRT is an evacuated glass tube equipped with various components.

2. A beam of electrons (cathode rays), emitted by an electron gun, passes through focusing and deflection systems hits on the phosphor coated screen to generate the desired picture.

3. The high speed electrons hit the phosphor coated screen to produce a spot of light controlled by a video controller.

ii. Plasma panel :

a. Plasma panels, also called gas discharge displays, are constructed by filling the region between two glass plates with a mixture of gases that usually includes neon.

b. A series of vertical conducting ribbons is placed on one glass panel and a set of horizontal ribbons is built into the other glass panel.

iii. Liquid Crystal Displays (LCDs) :

a. LCDs are non-emissive devices which produce a picture by passing polarized light from the surroundings of an internal light source through a liquid crystal material.

b. Liquid crystals are almost transparent substances, exhibiting the properties of both solid and liquid matter.

iv. Flat panel display :

a. Flat panel display is a display method that is designed to reduce the depth of the CRT display caused by the length of the tube.

b. The screens of these flat panel displays are made up of pairs of electrodes.

c. Each pair of electrodes is used to generate one picture element.

Que 5.12. **What are the characteristics of video display devices ?**

Answer

Important characteristics of video display devices :

1. Persistence :

a. Persistence is defined as the time it takes the emitted light from the screen to decay to one-tenth of its original intensity.

b. Lower persistence phosphors require higher refreshing rates to maintain a picture on the screen without flicker. However it is useful for displaying animations.

c. On the other hand higher persistence phosphors are useful for displaying static and highly complex pictures.

2. Resolution :

a. Resolution indicates the maximum number of points that can be displayed without overlap on the CRT.

b. It is defined as the number of points per centimeter that can be plotted horizontally and vertically.

c. Resolution depends on the type of phosphor, the intensity to be displayed and the focusing and deflection systems used in the CRT.

3. Aspect ratio :

a. It is the ratio of vertical points to horizontal points to produce equal length lines in both directions on the screen.

b. An aspect ratio of 4/5 means that a vertical line plotted with four points has the same length as a horizontal line plotted with five points.

Que 5.13. | **Write a short note on drivers.**

Answer

1. A driver is a program that interacts with a particular device or special (frequently optional) kind of software.

2. The driver contains the special knowledge of the device or special software interface that programs using the driver do not. In personal computers, a driver is often packaged as a Dynamic Link Library (DLL) file.

3. A driver in software provides a programming interface to control and manage specific lower level interface that is often linked to a specific type of hardware, or other low-level service.

4. In the case of hardware, the specific subclass of drivers controlling physical or virtual hardware devices is known as device drivers.

5. The main purpose of device drivers is to provide abstraction by acting as a translator between a hardware device and the applications or operating systems that use it.

6. Programmers can write higher-level application code independently of whatever specific hardware the end-user is using.

7. For example, a high-level application for interacting with a serial port may simply have two functions for "send data" and "receive data". At a lower level, a device driver implementing these functions would communicate to the particular serial port controller installed on a user's computer.

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1
UNIT

Introduction
(2 Marks Questions)

1.1. Define user interface.

Ans. The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand.

1.2. What are the two components of user interface ?

Ans. The user interface has essentially two components input and output. Input is how a person communicates his or her needs or desires to the computer. Output is how the computer conveys the results of its computations and requirements to the user.

1.3. Define human computer interaction.

Ans. User interface design is a subset of a field of study called human computer interaction. 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.

1.4. What are the advantages of graphical systems ?

Ans. Advantages of graphical systems :
1. Symbols recognized faster than text
2. Faster learning
3. Faster use and problem solving
4. Easier remembering
5. More natural

1.5. What are the disadvantages of graphical systems ?

Ans. Disadvantages of graphical systems :
1. Greater design complexity
2. Inconsistencies in technique and terminology
3. Inefficient for expert users
4. Not always familiar
5. Not always fastest style of interaction

1.6. Define extranet.

Ans. An extranet is a special set of intranet web pages that can be accessed from outside an organization or company. An extranet is a blend of the public Internet and the intranet.

1.7. **What is graphical user interface ?**

Ans. A user interface is a collection of techniques and mechanisms to interact with something. A graphical interface, the primary interaction mechanism is a pointing device of some kind. This device is the electronic equivalent to the human hand. The user interacts with a collection of elements referred to as objects. They can be seen, heard, touched, or otherwise perceived. Objects are always visible to the user and are used to perform tasks. They are interacted with as entities independent of all other objects. People perform operations, called actions, on objects.

1.8. **What are the characteristics of graphical user interface ?**

Ans. **Characteristics of the graphical user interface :**
1. Sophisticated visual presentation
2. Pick-and-click interaction
3. A restricted set of interface options
4. Visualization
5. Object orientation
6. Extensive use of a person's recognition memory
7. Concurrent performance of functions

1.9. **What are the characteristics of direct manipulation ?**

Ans. **Characteristics of direct manipulation :**
1. The system is portrayed as an extension of the real world.
2. Continuous visibility of objects and actions.
3. Actions are rapid and incremental with visible display of results.
4. Incremental actions are easily reversible.

1.10. **Define indirect manipulation.**

Ans. Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols, and substitutes typing for pointing.

1.11. **What are the design goals in creating user interface ?**

Ans. **Design goals in creating a user interface :**
1. Aesthetically pleasing
2. Clarity
3. Compatibility
4. Comprehensibility
5. Configurability
6. Consistency

1.12. **Write down the principles which established the foundation of graphical interfaces.**

Ans. **Principles established the foundation of graphical interfaces :**
1. The illusion of manipulable objects.
2. Visual order and viewer focus.
3. Revealed structure.
4. Consistency.
5. Appropriate effect or emotional impact.
6. A match with the medium.

1.13. What are the five commandments for designing process of user interface ?

Ans. The five commandments for designing process of user interface :

1. Gain a complete understanding of users and their tasks.
2. Solicit early and ongoing user involvement.
3. Perform rapid prototyping and testing.
4. Modify and iterate the design as much as necessary.
5. Integrate the design of all the system components.

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2
UNIT

Design Process
(2 Marks Questions)

2.1. What are the factors that make trouble for people in using computers ?

Ans. **Factors that make trouble for people in using computers are :**
1. Use of jargon
2. Non-obvious design
3. Fine distinctions
4. Disparity in problem-solving strategies
5. Design inconsistency

2.2. Name the important human characteristics in design.

Ans. **Important human characteristics in design are :**
1. Perception
2. Memory
3. Visual acuity
4. Foveal and peripheral vision
5. Sensory storage
6. Information processing
7. Learning
8. Skill
9. Individual differences

2.3. Define perception.

Ans. 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.

2.4. Define sensory storage.

Ans. 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.

2.5. Define foveal and peripheral vision.

Ans. 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. 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.

2.6. Write down some perceptual characteristics.

Ans. Perceptual characteristics include the following :
   1. Proximity
   2. Similarity
   3. Matching patterns
   4. Succinctness
   5. Closure

2.7. What is visual acuity ?

Ans. 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.

2.8. What are the user/task considerations in knowledge/ experience ?

Ans. User/task considerations in knowledge/experience :
   1. Computer literacy
   2. System experience
   3. Application experience
   4. Task experience
   5. Education
   6. Reading level
   7. Typing skill
   8. Native language or culture

2.9. What are the task considerations for job ?

Ans. User/task considerations for job :
   1. Type of system use
   2. Frequency of use
   3. Task or need importance
   4. Task structure
   5. Social interactions
   6. Primary training

2.10. Write down some psychological characteristics of user ?

Ans. **Psychological characteristics of user are :**
1. Attitude and motivation
2. Patience
3. Stress level
4. Expectation
5. Cognitive style

2.11. What are the user's physical characteristics ?

Ans. **User's physical characteristics :**
1. Age
2. Gender
3. Handedness
4. Disabilities

2.12. What are the direct methods for determining requirements for business ?

Ans. Direct methods for determining requirement for business :
1. **Individual face-to-face interview :** A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.
2. **Telephone interview or survey :** A structured interview conducted via telephone.
3. **Traditional focus group :** A small group of users and a moderator brought together to verbally discuss the requirements.
4. **Facilitated team workshop :** A facilitated, structured workshop held with users to obtain requirements information. It is similar to the traditional focus group.

2.13. What are the indirect methods for determining requirements for business ?

Ans. Indirect methods for determining requirement for business :
1. **MIS intermediary :** A company representative defines the user's goals and needs to designers and developers.
2. **Paper survey or questionnaire :** A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.
3. **Electronic survey or questionnaire :** A survey or questionnaire is administered to a sample of users using e-mail or the Web to obtain their needs.
4. **Electronic focus group :** A small group of users and a moderator discuss the requirements online using workstations.
5. **Marketing and sales :** Company representatives who regularly meet customers obtain suggestions or needs, current and potential.

2.14. Define conceptual model.

Ans. A conceptual model is the general conceptual framework through which the system's functions are presented. The model describes

how the interface will present objects, the relationships between objects, the properties of objects, and the actions that will be performed.

2.15. What are the basic business functions ?

Ans. Basic business functions :
  1. Gain a complete understanding of the user's mental model based upon :
     i. The user's needs and the user's profile.
     ii. A user task analysis.
  2. Develop a conceptual model of the system based upon the user's mental model. This includes :
     i. Defining objects.
     ii. Developing metaphors.

2.16. What are the typical psychological responses to poor design ?

Ans. Typical psychological responses to poor design are :
  1. Confusion
  2. Annoyance
  3. Frustration
  4. Panic or stress
  5. Boredom

2.17. What are the physical reactions to poor design ?

Ans. Physical reactions to poor design are :
  1. Abandonment of the system.
  2. Partial use of the system.
  3. Indirect use of the system.
  4. Modification of the task.
  5. Compensatory activity.

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3
UNIT

Screen Designing (2 Marks Questions)

3.1. Define the goals in design.

Ans. **Goals in design :**
   i. Reduce visual work.
   ii. Reduce intellectual work.
   iii. Reduce memory work.
   iv. Reduce motor work.
   v. Minimize or eliminate any burdens or instructions imposed by technology.

3.2. How to organize elements clearly and meaningfully ?

Ans. Visual clarity is achieved when the display elements are organized and presented in meaningful and understandable ways. Clarity is influenced by a multitude of factors :
   1. Consistency in design.
   2. A visually pleasing composition.
   3. A logical and sequential ordering.
   4. The presentation of the proper amount of information.
   5. Groupings.
   6. Alignment of screen items.

3.3. Name the ordering scheme.

Ans. **Ordering schemes include :**
   i. Conventional
   ii. Sequence of use
   iii. Frequency of use
   iv. Function
   v. Importance
   vi. General to specific

3.4. What are the qualities of visually pleasing composition ?

Ans. **Qualities of visually pleasing composition :**
   1. Balance
   2. Symmetry
   3. Regularity
   4. Predictability
   5. Sequentiality

6. Economy
7. Unity
8. Proportion
9. Simplicity
10. Groupings

3.5. Define balance.

Ans. Balance is stabilization or equilibrium, a midway center of suspension. The design elements have an equal weight, left to right, top to bottom.

3.6. Define symmetry.

Ans. Symmetry is axial duplication. A unit on one side of the centerline is exactly replicated on the other side. This exact replication creates formal balance, but the difference is that balance can be achieved without symmetry.

3.7. Define sequentiality.

Ans. Sequentiality is a plan of presentation to guide the eye through the screen in a logical, rhythmic order, with the most important information significantly placed. Sequentiality can be achieved by alignment, spacing, and grouping.

3.8. Define economy.

Ans. Economy is the frugal and judicious use of display elements to get the message across as simply as possible.

3.9. Define regularity.

Ans. Regularity is a uniformity of elements based on some principle or plan. Regularity in screen design is achieved by establishing standard and consistently spaced column and row starting points for screen elements.

3.10. Which techniques are used to provide emphasis ?

Ans. **To provide emphasis following techniques are used :**
1. Higher brightness
2. Reverse polarity or inverse video
3. Larger and distinctive font
4. Underlining
5. Blinking
6. Line rulings and surrounding boxes or frames

3.11. What are the guidelines for presenting information on screens ?

Ans. **Following are guidelines for presenting information on screens :**
1. Legibility
2. Readability
3. Usability
4. Contrasting display features
5. Visual lines
6. Consistency

3.12. Define statistical graphics.
Ans. A statistical graphic is data presented in a graphical format. A well-designed statistical graphic, also referred to as a chart or graph, consists of complex ideas communicated with clarity, precision, and efficiency. It gives its viewer the greatest number of ideas, in the shortest time, and in the smallest space, and with least possible clutter.

3.13. What are the components of statistical graphics ?
Ans. **Components of a statistical graphic :**
1. Data presentation
2. Axes
3. Scales and scaling
4. Proportion
5. Lines
6. Labeling

3.14. What are the types of statistical graphics ?
Ans. **Types of statistical graphics :**
1. Curves and line graph
2. Surface charts
3. Scatterplots
4. Bar graphs
5. Histograms
6. Segmented or stacked bars
7. Pie charts

3.15. Define scatterplots.
Ans. Scatterplots can be used to show relationships among individual data points in a two-dimensional array. A point is displayed on the plot where the X-axis and Y-axis variables intersect. Correlations and trends on scatterplots can be indicated by the superimposition of curves.

3.16. Define bar graphs.
Ans. A bar graph consists of a series of bars extending from a common origin or baseline, or they extend between separately plotted high and low points.

3.17. Define pie chart.

Ans. Pie chart is a circle broken up into pie-shaped pieces that can be used to show an apportionment of a total into its component parts. Pie charts should be used with caution.

3.18. Define screen density.

Ans. Density is a calculation of the proportion of display character positions on the screen, or an area of the screen containing something. Density is clearly related to complexity, since both measures "how much is there". Complexity looks at elements, density at characters, so they should rise and fall together.

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**4
UNIT**

Windows (2 Marks Questions)

4.1. Define windows.

Ans. A window is an area of the screen, usually rectangular in shape, defined by a border that contains a particular view of some area of the computer or some portion of a person's dialog with the computer.

4.2. Write down the characteristics of windows.

Ans. **A window is seen to possess the following characteristics :**
1. A name or title, allowing it to be identified.
2. A size in height and width (which can vary).
3. A state, accessible or active, or not accessible. (Only active windows can have their contents altered).
4. A location, relative to the display boundary.

4.3. What are the components of window ?

Ans. **Components of a window :**
1. Frame
2. Title bar
3. Menu bar
4. Status bar
5. Scroll bar

4.4. What are the types of window ?

Ans. **Types of windows :**
1. Primary window
2. Secondary windows
3. Dialog boxes
4. Property sheets and property inspectors

4.5. Define primary window.

Ans. The primary window is the first one that appears on a screen when an activity or action is started. It is required for every function or application, possessing a menu bar and some basic action controls.

4.6. Describe the structure of menus.

Ans. **The most common structures of menus are :**
1. Single menus
2. Sequential linear menus

   3. Simultaneous menus
   4. Hierarchical menus
   5. Connected menus

4.7. Define connected menus.

Ans. Connected menus are networks of menus all interconnected in some manner. Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.

4.8. Define trackball.

Ans. The trackball is a ball that rotates freely in all directions in its socket. The ball is rotated with one's fingertips, and its direction and speed are tracked and translated into equivalent screen cursor movement. Trackballs are well suited for navigational control, as in video games or exploration of 3-D environments.

4.9. What are advantages of trackball ?

Ans. Advantages of trackball :
   1. Direct relationship between hand and pointer movement in terms of direction and speed.
   2. Does not obscure vision of screen.
   3. Does not require additional desk space (if mounted on keyboard).

4.10. What is touch screen ?

Ans. A touch screen is a screen that consists of a special surface sensitive to finger or stylus touch. Objects on the screen are pointed to and touched to select them.

4.11. What is a graphic tablet ?

Ans. Graphic tablet, also called a touch tablet, is a device with a horizontal surface sensitive to pressure, heat, light, or the blockage of light. It may lie on the desk or may be incorporated on a keyboard, and it is operated with fingers, light pen, or objects like a pencil or stylus. The screen pointer imitates movement on the tablet.

4.12. Define joystick.

Ans. A joystick is a stick or bat-shaped device usually anchored at the bottom. They come in variable sizes, smaller ones being operated by fingers, larger ones requiring the whole hand. The smaller joysticks require fine motor coordination, the larger ones more gross coordination.

4.13. Describe selection controls.

Ans. A selection control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value. The relevant item or items are selected from

those displayed. Some selection controls present all the alternatives together, visibly on a screen. Selection controls include radio buttons, check boxes, list boxes, drop-down/pop-up list boxes, and palettes.

4.14. What is text ?

Ans. Text is any textual element that appears on a screen, including field captions, headings, words, sentences, messages, and instructions. Text refers to body text, a large compilation of words whose smallest element is a paragraph and whose maximum length is unlimited, its size being governed by the reason for its existence.

4.15. What are problem with color ?

Ans. **Possible problems with color are :**
1. High attention getting capacity
2. Interference with use of other screens
3. Varying sensitivity of the eye to different colors
4. Color viewing deficiencies

4.16. What are advantages of tiled windows ?

Ans. **Advantages of tiled windows :**
1. The system usually allocates and positions windows for the user, eliminating the necessity to make positioning decisions.
2. Open windows are always visible, eliminating the possibility of them being lost and forgotten.
3. Every window is always completely visible, eliminating the possibility of information being hidden.

4.17. What are the disadvantages of tiled windows ?

Ans. **Disadvantages of tiled windows :**
1. Only a limited number can be displayed in the screen area available.
2. As windows are opened or closed, existing windows change in size. This can be annoying.
3. As windows change in size or position, the movement can be disconcerting.

4.18. List down the advantages of overlapping windows.

Ans. **Advantages of overlapping windows :**
1. Windows can maintain consistent sizes.
2. Windows can maintain consistent positions.
3. Screen space conservation is not a problem, because windows can be placed on top of one another.
4. There is less pressure to close or delete windows no longer needed.

4.19. List down the disadvantages of overlapping windows.

Ans. **Disadvantages of overlapping windows :**
1. They are operationally much more complex than tiled windows.
2. More control functions require greater user attention and manipulation.
3. Information in windows can be obscured behind other windows.
4. Windows themselves can be lost behind other windows and be presumed not to exist.

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5
UNIT

Software Tools
(2 Marks Questions)

5.1. Define software tool.

Ans. A software tool is programmatic software used to create, maintain, or otherwise support other programs and applications.

5.2. What are commonly used software tools ?

Ans. Some of the commonly used software tools in HCI are as follows :
1. Specification methods
2. Grammars
3. Transition diagram
4. Statecharts
5. Interface building tools
6. Evaluation tools

5.3. Define specification method.

Ans. Specification methods are the methods used to specify the GUI. Even though these are lengthy and ambiguous methods, they are easy to understand.

5.4. What are interface building tools ?

Ans. Interface building tools are the design methods that help in designing command languages, data-entry structures, and widgets.

5.5. Define transition diagrams.

Ans. A transition diagram has a set of nodes that represent system states and a set of links between the nodes that represent possible transitions. Each link is labeled with the user action that selects that link and possible computer responses.

5.6. Write down the features of interface building tools.

Ans. Features of interface building tools :
1. User interface independence
2. Methodology and notation
3. Rapid prototyping
4. Software support

5.7. **Write down some interaction devices.**

Ans. **Some interaction devices are :**
1. Touch screen
2. Gesture recognition
3. Speech recognition
4. Keyboard

5.8. **Define gesture and speech recognition.**

Ans. **Gesture recognition :** Gesture recognition is a subject in language technology that has the objective of understanding human movement via mathematical procedures.

Speech recognition : The technology of transcribing spoken phrases into written text is speech recognition.

5.9. **Define keyboard.**

Ans. A keyboard can be considered as a primitive device which uses an organization of keys/buttons that serves as a mechanical device for a computer. Each key in a keyboard corresponds to a single written symbol or character.

5.10. **List down the six interaction tasks for pointing devices.**

Ans. **Six interaction tasks for pointing devices are :**
1. Select
2. Position
3. Orient
4. Path
5. Quantify
6. Text

5.11. **What are the types of pointing devices ?**

Ans. **Classification of pointing devices based on control :**
1. Direct control on the screen surface, such as the touchscreen or stylus.
2. Indirect control away from the screen surface such as the mouse, trackball, joystick, graphics tablet, or touchpad.

5.12. **Define trackball.**

Ans. Trackball is a movable ball that mounted on top of the stationary device. The ball gives an advantage for good locations where a mouse cannot move around enough.

5.13. **Define lightpen.**

Ans. The lightpen is a device that enabled users to point to a spot on a screen and then press a button to perform a select, position, or other task.

5.14. Define stylus.

Ans. The stylus is an attractive device because it is familiar and comfortable for users, and users can guide the stylus tip to the desired location while keeping the whole context in view.

5.15. Define quantify.

Ans. Quantify means to specify a numeric value. The quantify task is usually a one-dimensional selection of integer or real values to set parameters, such as the page number in a document, the velocity of a ship, or the amplitude of a sound.

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B. Tech.
(SEM. VII) ODD SEMESTER THEORY EXAMINATION, 2019-20
HUMAN COMPUTER INTERFACE

Time : 3 Hours   **Max. Marks : 70**

Note : Attempt **all** sections. If require any missing data; then choose suitably.

Section-A

1. Attempt **all** questions in brief.
   a. **Differentiate between keyboards and keypads.**

   b. **How can we achieve usability ?**

   c. **Compare and contrast between specificity and generality.**

   d. **Explain four pillars of design.**

   e. **List the strategies for command organization.**

   f. **Explain any two pointing devices in detail.**

   g. **Define the term multidimensional data.**

Section-B

2. Attempt any **three** of the following :   **(7 × 3 = 21)**
   a. **Discuss different advanced filtering and search techniques in detail.**

   b. **What are the guidelines for alphanumeric displays, spreadsheets and graph ?**

   c. **Discuss the social impact statement for early design review.**

   d. **What is heuristic evaluation ? Why is it used ? Outline the steps involved for expert review.**

   e. **What do you mean by multimedia document ? Discuss various challenges involved in searching a multimedia document.**

Section-C

3. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Compare and contrast between the linear menus and tree structured menus with examples.

b. Explain various visual techniques required to augment visual pleasing composition of user screen.

4. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Describe choosing colors for statistical graphical screens.

b. What are the advantages and disadvantages of online manuals ?

5. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Explain three pillars of successful user interface development in detail.

b. Explain the six stages of LUCID development methodology.

6. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Explain about online tutorials, demonstrations and guides.

b. Explain the simple stages of action model of system response time and user think time.

7. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Write short notes on the following :
 i. Statistical graphics
ii. Human interaction speeds

b. List few common mistakes of web-based display of information and explain.

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SOLUTION OF PAPER (2019-20)

Note : Attempt **all** sections. If require any missing data; then choose suitably.

Section-A

1. Attempt **all** questions in brief.

a. Differentiate between keyboards and keypads.

Ans. Keypad is a small board with keys primarily used for tactile input into a machine while keyboard is a set of keys used to operate a typewriter, computer etc.

b. How can we achieve usability ?

Ans. Usability focuses on how well users can learn and use a product to achieve their goals. It also refers to how satisfied users are with that process. To gather this information, practitioners use a variety of methods that gather feedback from users about an existing site or plans related to a new site.

c. Compare and contrast between specificity and generality.

Ans.

S. No.	Specificity	Generality
1.	Promotes complexity, inhibits identification of simple frameworks.	Organizes diverse constructs, provides convenient frames of reference.
2.	Makes behavioral study seem difficult.	Makes the study of behavior seem easy.
3.	Allows more refined person-situation fit.	Impedes efforts to study and improve the fit between individual and situation (*i.e.*, job).
4.	Complete understanding of causes, effects, and measurement.	Limits understanding of causes, effects, and measurement.
5.	Contributes to validation by emphasizing construct content.	Contributes to validation by emphasizing its structural aspect.

d. Explain four pillars of design.

Ans. **Four pillars of design :**
1. **Navigation :** Effective navigation clearly displays full range of navigation available on current page. It also indicates how to get back (using Breadcrumb) from the point of navigation invoke.
2. **Presentation :** Presentation means how to present information on the page. Visual processing, user's attention, layout are some factors which affects presentation.
3. **Content :** Content means the information and experiences directed towards an end-user.
4. **Interaction :** Interaction is the point where visual design is processed and user's action (response/motor) is initiated.

e. List the strategies for command organization.

Ans. **List of command organizations strategies are :**
1. Command plus arguments
2. Command plus options and arguments
3. Hierarchical command structure

f. Explain any two pointing devices in detail.

Ans.
1. **Lightpen :** The lightpen is a device that enabled users to point to a spot on a screen and then press a button to perform a select, position, or other task.
2. **Mouse :** The mouse is appealing because of its low cost and wide availability. The hand rests in a comfortable position, buttons on the mouse are easy to press, long motions can be done rapidly by moving the forearm, and positioning can be done precisely with small finger movements.

g. Define the term multidimensional data.

Ans. Data which related to more than two dimensions is known as multidimensional data.

Section-B

2. Attempt any **three** of the following :   **(7 × 3 = 21)**
a. Discuss different advanced filtering and search techniques in detail.

Ans.
1. **Collaborative filtering :**
   a. Groups of users combine evaluations to help in finding items in a large database.
   b. User "votes" and their info is used for rating the item of interest, for example, a user rating six restaurants highly is given a list of restaurants also rated highly by those who agree the six are good.

2. Multilingual searches :
  a. Current systems provide rudimentary translation searches.
  b. Prototypes of systems with specific dictionaries and more sophisticated translation.

3. Visual searches :
  a. Specialized visual representations of the possible values, for example, dates on a calendar or seats on a plane.
  b. On a map the location may be more important than the name – Implicit initiation and immediate feedback.

b. What are the guidelines for alphanumeric displays, spreadsheets and graph ?

Ans. **Guidelines for alphanumeric display :**

1. Consistency : It includes :
  a. Consistent display formats so the user knows where to look for information.
  b. Consistent labeling of information.

2. Brevity :
  a. It acknowledges that the human user is limited in the amount of information that can be absorbed in a given period of time.
  b. Overall density, often expressed as a percentage of the total character spaces available, measured the number of characters displayed.
  c. Local density, usually manipulated by altering line spacing, is an indicator of the number of filled spaces near each character.
  d. Low density numbers should mean good user comprehension.

3. Compatibility :
  a. It minimizes the amount of information recoding that must be done by the user.
  b. Good compatibility ensures efficient information assimilation by the user. Related data should be grouped together.
  c. The layout complexity of a display should follow a predictable visual scheme.

Guidelines for tabular format (Spreadsheet) :

1. An output should be clear and readable :
  a. Its details should be convincing.
  b. It should facilitate decision making.

2. Tabular format is preferred under following circumstances :
  a. Details are the dominant requirements.
  b. Very few comments or narration is needed.

3. Suggestions for preparing tabular format :
  a. Major categories should be included.
  b. Each category should be labeled.
  c. Information should have unique identification.
  d. Information should be appropriately ordered.

e.   Totals must be drawn (with appropriate control breaks).

f.   Exceptions should be highlighted.

Guidelines for graphs :

1. Graph presentation systems are widely used for presenting information as it adds extra value to numeric data.

2. Pie chart, bar chart, maps, curves are frequently used business graphs.

3. Graphs are used when we want to :
   a.   Present data effectively.
   b.   Manage information volume.
   c.   Suit personal preferences.

4. Following standards should be used for designing graph :
   a.   Use of icons is now becoming common. Choosing a correct icon is very important.
   b.   Use of colours.

c. Discuss the social impact statement for early design review.

Ans. **Social impact statement for early design :**

1. **Describe the new system and its benefits :**
   a.   Convey the high level goals of the new system
   b.   Identify the stakeholders
   c.   Identify specific benefits

2. **Address concerns and potential barriers :**
   a.   Anticipate changes in job functions and potential layoffs
   b.   Address security and privacy issues
   c.   Discuss accountability and responsibility for system misuse and failure.
   d.   Avoid potential biases
   e.   Weigh individual rights and social benefits

3. **Assess trade-offs between centralization and decentralization :**
   a.   Preserve democratic principles.
   b.   Ensure diverse access.
   c.   Promote simplicity and preserve what works.

4. **Outline the development process :**
   a.   Present and estimated project schedule.
   b.   Propose process for making decisions.
   c.   Discuss expectations of how stakeholders will be involved.
   d.   Recognize needs for more staff, training, and hardware.
   e.   Propose plan for backups of data and equipment.
   f.   Outline plan for migrating to the new system.

d. What is heuristic evaluation ? Why is it used ? Outline the steps involved for expert review.

Ans. **Heuristic evaluation :**
1. A heuristic evaluation is a usability inspection method for computer software that helps to identify usability problems in the user interface design.
2. It involves evaluators examining the interface and judging its compliance with recognized usability principles.

Uses :
1. It is used for finding both major and minor problems in a user interface.
2. Heuristic evaluations can be employed early in the design life cycle to find usability problems.

Steps involved for expert reviews are :
1. **Understand the method and human behavior :** An expert review is not just our opinion of likes and dislikes. While we do need to use our judgment, that judgment should be guided by principles of how humans interact with computers.

2. **Have some idea of common tasks users will perform :**
   a. A common way to apply the expert review is to use a modified cognitive walkthrough.
   b. Decompose each task as the user would attempt it, and try and think like the users.
   c. This means we should have some data on both the type of tasks and the type of domain knowledge the users are likely to know when they are using the interface.

3. **Conduct the review methodically and independently :**
   a. Conduct the review.
   b. Use a Word document, spreadsheet, PowerPoint deck, paper, or web form to record our observations.
   c. Think globally and locally about the experience : look for issues that span multiple screens (like navigation) and issues that are more idiosyncratic (like content or actions on a specific page).

4. **Have another expert perform an independent review :** Expert reviews are best used when we cannot conduct a usability test or in conjunction with insights collected from observing even just a handful of users attempting realistic tasks on a website or application.

5. **Categorize, reconcile differences, and add severity :**
   a. Aggregate your results and report on which issues multiple evaluators identified. This will help corroborate the findings (a measure of validity).
   b. Reconcile the problems that only some (or one) of the evaluators found and see whether these are unique problems or just different instances of another problem already identified.

   c.   Expect to find a lot of unique problems, but remember that just because only one evaluator identified it, does not mean it is not a legitimate problem.

e. What do you mean by multimedia document ? Discuss various challenges involved in searching a multimedia document.

Ans. Multimedia document :
1. Multimedia document is defined as a digital document that is composed of one or multiple media elements of different types (text, image, video, etc.) as a logically coherent unit.
2. A multimedia document is a natural extension of a conventional textual document in the multimedia area.
3. A multimedia document can be a single picture or a single MPEG video file, but more often it is a complicated document such as a Web page consisting of both text and images.

Challenges for searching multimedia documents are :
1. In the searching of audio the challenge is to search audio based on the content of the sound.
2. Efficiently searching video is complex because the search engines or tools have to be sophisticated enough to handle movement, lighting, and different camera angles.
3. Describing images in semantic terms and then retrieving image is a challenge.

Section-C

3. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Compare and contrast between the linear menus and tree structured menus with examples.

Ans. Linear menu sequences : They are generally used to guide the user in selecting his choice through a sequence of menus. That is when the user selects a particular choice, this choice results in another menu which in turn leads to selecting another choice.

For example :
1. While ordering a pizza we order according to the size of pizza, the thickness of the base, the type of sauce and the type of cheese.
2. We can use such menus for shopping websites. When a user visits a shopping website and he wants to shop shoes. The user is first prompted to select shoe size, color etc.

Tree structured menus :
1. This form of menu helps us to assign all the menu items in a hierarchical order.
2. This makes the classification easier and user identification a lot easier.
3. These are usually used preferred in designing very large websites.

For example :

1. In shopping websites such as Flipkart, product related to mobile and laptops are grouped in electronic category and product related to t-shirts and jeans are grouped in clothing category.

2. Windows Explorer is an example of tree structured menu.

b. Explain various visual techniques required to augment visual pleasing composition of user screen.

Ans.

Visually pleasing composition draws attention subliminally, conveying a positive message clearly and quickly.

It include following qualities :

1. Balance :

i. Balance is stabilization or equilibrium, a midway center of suspension.

ii. The design elements have an equal weight, left to right, top to bottom.

iii. The opposite of balance is instability; the design elements seemingly ready to topple over.

iv. Our discomfort with instability, or imbalance, is reflected every time we straighten a picture hanging askew on the wall.

v. Balance is most often informal or asymmetrical, with elements of different colors, sizes and shapes being positioned to strike the proper relationships.

vi. Dark colors, unusual shapes, and larger objects are "heavier" whereas light colors, regular shapes, and small objects are "lighter".

vii. Balance on a screen is accomplished through centering the display itself, maintaining an equal weighting of components on each side of the horizontal and vertical axis, and centering titles and illustrations.

2. Symmetry :

i. Symmetry is axial duplication. A unit on one side of the centerline is exactly replicated on the other side.

ii. The exact replication creates formal balance, but the difference is that balance can be achieved without symmetry.

iii. Symmetry's opposite is asymmetry. Our eye tends to perceive something as more compressed or compact when it is symmetric.

iv. Asymmetric arrays are perceived as larger.

3. Regularity :

i. Regularity is a uniformity of elements based on some principle or plan.

ii. Regularity in screen design is achieved by establishing standard and consistently spaced column and row starting points for screen elements.

iii. It is also achieved by using elements similar in size, shape, color, and spacing.

iv. The opposite of regularity is irregularity that exists when no such plan or principle is apparent.

v. A critical element on a screen will stand out better, however, if it is not regularized.

4. Predictability :

i. Predictability suggests a highly conventional order or plan.

ii. Viewing part of a screen enables one to predict how the rest of the screen will look.

iii. The opposite of predictability is spontaneity that suggests no plan and thus an inability to predict the structure of the remainder of a screen or the structure of other screens.

iv. In screen design, predictability is also enhanced through design consistency.

5. Economy :

i. Economy, is the frugal and judicious use of display elements to get the message across as simply as possible. The opposite is intricacy, the use of many elements just because they exist.

ii. The effect of intricacy is ornamentation, which often detracts from clarity.

iii. Economy in screen design means mobilizing just enough display elements and techniques to communicate the desired message, and no more.

6. Unity :

i. Unity is coherence, a totality of elements that is visually all one piece.

ii. With unity, the elements seem to belong together, to dovetail so completely that they are seen as one thing. The opposite of unity is fragmentation, each piece retaining its own character.

iii. In screen design similar sizes, shapes, and colors promote unity, as does white space borders at the display boundary.

iv. Unity should exist between related screens, and web site screens, as well.

7. Sequentiality :

i. Sequentiality is a plan of presentation to guide the eye through the screen in a logical, rhythmic order, with the most important information significantly placed.

ii. Sequentiality can be achieved by alignment, spacing, and grouping.

iii. The opposite of sequentiality is randomness, whereby an arrangement and flow cannot be detected.

8. Simplicity :

i. Simplicity is directness and singleness of form, a combination of elements that results in ease of comprehending the meaning of a pattern.

ii.   The opposite pole on the continuum is complexity.

iii. The scale created may also be considered a scale of complexity, with extreme complexity at one end and minimal complexity (simplicity) at the other.

9. Grouping :

i.   Grouping screen elements aids in establishing structure, meaningful relationships, and meaningful form.

ii.   In addition to providing aesthetic appeal, past research has found that grouping aids in information recall and results in a faster screen search.

4. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Describe choosing colors for statistical graphical screens.

Ans.

1.   When choosing colors for display, one must consider the following factors :

i.   The human visual system.

ii.   The possible problems that the colors use may cause.

iii. The viewing environment in which the display is used.

iv.   The task of the user.

v.   How the colors will be used.

vi.   The hardware on which the colors will be displayed.

2.   The primary objective in using color is communication, to aid the transfer of information from the screen to the user.

3.   Choosing colors for categories of information requires a clear understanding of how the information will be used.

4.   If different parts of the screen are attended to separately, color-code the different parts to focus selective attention on each in turn.

5.   If decisions are made based on the status of certain types of information on the screen, color-code the types of status that the information may possess.

6.   If screen searching is performed to locate information of a particular kind or quality, color-code these kinds or qualities for contrast.

7.   If the sequence of information use is constrained or ordered, use color to identify the sequence.

8.   If the information displayed on a screen is packed or crowded, use color to provide visual groupings.

9.   Use color as a redundant screen code.

b. What are the advantages and disadvantages of online manuals ?

Ans. Advantages :

1.   Less expensive to set up.

2.   Correcting entries may be easier with manual systems, as opposed to computerised ones that can leave complicated audit trails.

3. The risk of corrupted data is much less.
4. Data loss is less of a risk, particularly if records are stored in a fire-proof environment.
5. Problems with duplicate copies of the same records are generally avoided.

Disadvantages :

1. Takes up a lot of space.
2. Prone to damage and being misplaced.
3. Access time.
4. Lack of security.

5. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Explain three pillars of successful user interface development in detail.

Ans. Three pillars of successful user interface development are :

1. User interface requirements :
   a. Soliciting and clearly specifying user requirements is a major key to success in any development activity.
   b. Laying out the user interface requirements is part of the overall requirements development and management process.
   c. User interface requirements describe system behavior.

2. Guidelines documents and processes : Each project has different needs, but guidelines should be considered for :
   a. Words, icons, and graphics
   b. Screen-layout issues
   c. Input and output devices
   d. Action sequences
   e. Training

3. User interface software tools :
   a. One difficulty in designing interactive systems is that customers and users may not have a clear idea of what the system will look like when it is done.
   b. Since interactive systems are novel in many situations, user may not realize the implications of design decisions.
   c. It is difficult, costly, and time-consuming to make major changes to systems once those systems have been implemented.

b. Explain the six stages of LUCID development methodology.

Ans. LUCID (Logical User Centered Interaction Design) is a framework to manage the process of designing an interface in a way which can help in software usability.

LUCID is organized into six stages :

Stage 1 : Envision :

1. The purpose of stage 1 is to create a clear, shared vision of the product.

2. This vision is described in the UI Roadmap that communicates the design vision, manages expectations, and serves as the basis for evaluating progress throughout the project.

Goals :

1. Create a concise description of the product.
2. Identify the business and design objectives that will shape the design.
3. Identify the target user population.
4. Identify the main functionality of the product.

Stage 2 : Analyze :

1. In stage 2, members of the design group work with representatives of the user community to document work processes and identify specific needs.
2. This information is used to produce the requirements analysis.

Goals : The primary goal of stage 2 is to uncover the underlying workflow process and develop a set of objects to represent it.

Stage 3 : Design :

In stage 3, the product's basic design, including overall navigation, screen layout and visual design and information or work-flow organization, is defined.

Goals :

1. The key goal of stage 3 is the development of the key screen prototype, which will be used as the basis for the interface design specifications in stage 4.
2. The key screen prototype demonstrates the software basic navigation and 'look and feel', as well as screen layout and critical screen objects.

Stage 4 : Refine :

1. In stage 4, iterative refinement is used to transform the prototype into a complete specification.
2. Two processes are used to expand the prototype: elements that were not fully detailed are fleshed out, and designs are added for functions that were not originally included.

Goals : The key goal of stage 4 is to complete the development of the prototype and create the specifications for the interface design, which the developers can use to implement the program.

Stage 5 : Implement :

1. Once the design specification created in stage 4 is passed to the programming team, the technical development process begins.
2. In addition, the installation procedures must be designed and tested.

Goals : The goal stage 5 is to make any design changes required by unexpected technical problems, and monitor the development work for usability problems which may be introduced.

Stage 6 : Support : In stage 6, the new product is released to the user community. This phase, often unplanned, is critical to the acceptance of the product.

Goals : The key goal of stage 6 is the successful introduction of the new product into the workplace or marketplace.

6. Attempt any **one** part of the following :   **(7 × 1 = 7)**

a. Explain about online tutorials, demonstrations and guides.

Ans. **Online tutorials :**

1. An online tutorial is an interactive training environment in which users can view explanatory descriptions of user-interface objects and actions, often tied to realistic task scenarios.

2. There are many approaches to the use of electronic media to teach users how to master an interface.

3. Depending on the complexity of the interface and the amount of time users are ready to spend absorbing the tutorial materials, they might be served well by an extensive computer-based training module, an animated demonstration of features, or a recorded welcome message by a familiar person.

4. It reviews a range of online possibilities, from textual and graphical tutorials to animated demonstrations and guides.

Animated demonstrations :

1. Animated demonstrations have become a modern high-tech art form.

2. Manufacturers originally designed them mostly to attract potential users of software or hardware by showing off system features using the best animations, colour graphics, sound, and information presentation that advertising agencies can produce.

3. Those demonstrations focus on building a positive product image.

4. More recently, demonstrations have become a standard technique to train users as they work.

5. The focus is on demonstrating step-by-step procedures and explaining the results of the actions.

6. An animated demonstration can be prepared as a slide show, a screen-capture animation, or a video recording of a person using the device.

Guides :

1. Audio and video recordings of human guides, such as the marketing manager for the software, a famous personality related to the content, or a cartoon character for children, can lead users through a body of knowledge.

2. This approach does not anthropomorphize the computer, but rather makes the computer a medium of communication.

3. For games and software, a cartoon character has been shown to be equally helpful and appealing as a real person.

b. Explain the simple stages of action model of system response time and user think time.

Ans.

1. For users the main experience of quality of service is the computer's response time.
2. Response time is the number of seconds it takes from the time a user initiates an action until the computer presents the results.
3. User think time is the number of seconds the user thinks before entering the next action.

   Simple stages of action model :
   a. Initiation of an action.
   b. Wait for computer's response.
   c. Observe while results appear.
   d. Think about results.

3. This simple model is not realistic because users plan while they are initiating an action (typing/clicking), waiting for results to appear, and interpreting results.
4. Because users are able to use this time to plan, it is very difficult to obtain precise measurements of user think time.
5. Response time is usually easier to estimate.
6. Many times pop-up messages are displayed immediately after the initiation of an action so the response time does not seem as long.

7. Attempt any **one** part of the following : **(7 × 1 = 7)**
a. Write short notes on the following :
i. Statistical graphics
ii. Human interaction speeds

Ans.

i. Statistical graphics :
1. A statistical graphic is data presented in a graphical format.
2. A well-designed statistical graphic, also referred to as a chart or graph, consists of complex ideas communicated with clarity, precision, and efficiency.
3. It gives its viewer the greatest number of ideas, in the shortest time, and in the smallest space, and with least possible clutter.
4. It will also induce the viewer to think of substance, not techniques or methodology.
5. It will provide coherence to large amounts of information by tying them together in a meaningful way, and it will encourage data comparisons of its different pieces by the eye.
6. A well designed statistical graphic display also avoids distortions by telling the truth about the data.

ii. Human interaction speeds :
The speed at which people can perform using various communication methods has been studied by a number of researchers. The following, have been found to be typical interaction speeds for various tasks. These speeds are :

1. Reading :
   i.   The average adult, reading English prose in the United States, has a reading speed in the order of 250-300 words per minute.
   ii. Proofreading text on paper has been found to occur at about 200 words per minute, on a computer monitor, about 180 words per minute.

2. Listening :
   i.   Words can be comfortably heard and understood at a rate of 150 to 160 words per minute.
   ii. This is generally the recommended rate for audio books and video narration 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.

3. Speaking :
   i.   Dictating to a computer occurs at a rate of about 105 words per minute.
   ii. Speech recognizer misrecognitions often occur, however, when word correction times are factored in, the speed drops significantly, to an average of 25 words per minute.
   iii. It is also found that the speaking rate of new users was 14 words per minute during transcription and 8 words per minute during composition.

4. Keying :
   i.   Fast typewriter typists can key at rates of 150 words per minute and higher.
   ii. Average typing speed is considered to be about 60-70 words per minute.
   iii. Computer keying has been found to be much slower, however.
   iv. Speed for simple transcription was only 33 words per minute and for composition only 19 words per minute.
   v.   The fastest typists typed at only 40 words per minute, the slowest at 23 words per minute.
   vi. Two-finger typists can key memorized text at 37 words per minute and copied text at 27 words per minute.
   vii. Something about the computer, its software, and the keyboard does seem to significantly degrade the keying process.

5. Hand printing :
   i.   People hand print memorized text at about 31 words per minute.
   ii. Text is copied at about 22 words per minute.

b. List few common mistakes of web-based display of information and explain.

Ans. Following are common mistakes of web-based display of information :
   1. Burying information too deep in a website.

2. Overloading pages with too much material.
3. Providing awkward or confusing navigation.
4. Putting information in unexpected places on the page.
5. Not making links obvious and clear.
6. Presenting information in bad tables.
7. Making text so small that many users cannot read it.
8. Using color combinations for text that many users cannot read.
9. Using bad forms.
10. Hiding (or not providing) features that could help users.

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