HMI Module - 1

Q1. Explain HMI with example. Give an example of HMI hardware.
Ans:

- Human-computer interaction or Human Machine 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.
- Human:
    - The human, the user, is the one whom computer systems are designed to assist.
    - Human interacts with various digital system with their senses
    a. Vision: it is the primary information gathering process about the system.
    b. Hearing: auditory systems can collect a lot of useful information as well from surroundings which can be used for processing data.
    c. Touch: it provides vital information about the environment which can be used for processing data.
    d. Movements: Movement time is dependent largely on the physical characteristics of the subjects: their age and fitness. Speed and accuracy is of primary importance for designing interactive systems.
- Machine:
    - It can be defined as anything which can reduce human effort.
    - It reduces human involvement and labour.
    - Advanced machines are having high computing power for best output and functionality and the system is easier to use.
- Interaction:
    - Users can instruct the machine using its interface or device controller.
    - The machine will display result using some display device.
- Example: Glucometer.
    - User will give a blood sample to the instrument for checking.
    - As the machine gets the sample, it will start processing and then the user interface will give the value of blood sugar.

Q2. Describe the software and hardware requirements of HMI with examples.
Ans:

- Hardware is an essential part of any computing device.
- Hardware is generally selected as per user’s requirements and can top it up with any software application.
- Software will help developers to design user interfaces for machines.
- There are many softwares available for developing user interfaces for underlying platforms.
- Example: HMI System to record Biometric Attendance System.
- All offices have a biometric attendance system.
- The hardware requirements for same are given as below
    a. Sensor

    b. Computer
    c. LAN connection
- The software requirements are:
    a. Biometric Driver
    b. File System

Q3. Describe HMI runtime environment with examples.
Ans:

- The operating or runtime environment is a supporting framework for hardware and software devices.
- The design created by the developer should be user level acceptable and user suggestions should be considered while developing.
- The operational environment should avoid all compatibility problems to hardware and software.
- The rules/guidelines for user interface design:
    a. Friends, family and colleagues are not representative of the target users.
    b. User requirements must be understood by a team and not an individual.
    c. It must minimise the user's complications.
    d. The hardware and software should be managed properly.
- Example: HMI System to record Biometric Attendance System.
- The runtime environment requirements are:
    a. Sensor device.
    b. Server system.

Q4. Write short note on :

a. Psychopathology of everyday things:
   Ans:
    - Psychopathology can be explained as :
    - Psycho means mind status.
    - Pathos means disease.
    - Logy means study.
    - Psychopathology means a branch of study dealing with mental illness.
    - In HMI, it indicates patterns of design in our everyday things and procedures.

b. Psychology of everyday actions - How people do things:
   Ans:
    - The common behaviour of humans for poor interface design is to assume responsibility for himself.

- Generally for a new product, users will follow the trial and error method for understanding the use of the system.
- If the trial and error method fails, then the user will ask someone more experienced to help.
- The user manual can be the other way of operating the system without any help from anyone.
- The new user always tries to understand the system or product, because humans tend to believe it is difficult to understand a new product.
- Humans have a tendency to compare between multiple products in the market performing the same task or activity.

Q5. Explain seven stages of action with each phase in detail.
Ans:

- As per Norman, human actions will have two basic aspects:
    1. execution and
    2. evaluation.
- The task performed by humans is referred to as action (execution).
- Once action is performed, it must be analysed for improvement (evaluation).
- Stages of actions:
    - Stage 1: setting the goal of action.
- Execution:
    a. Stage 2: Set up a plan of actions.
    b. Stage 3: Specifying an action to be performed.
    c. Stage 4: Performing the action.
- Evaluation:
    a. Stage 5: Identify the state of the external world.
    b. Stage 6: Interpreting the state of the external world.
    c. Stage 7: Evaluation of Action output by comparison with other actions.
- The procedures of the above seven stages look very easy but need to be done systematically.
- Humans always feel a gap between what they want to do and what they have done. This concept is termed as Gulf of Execution and Evaluation.

Q6. Explain three levels of processing with each phase in detail.
Ans:

- The processing can be done in three steps.
- End users can share experiences by designing models and convert them into prototypes for development.
- Three levels at which we process information available, the seven stages of our actions can be understood in a simple way as every stage will perform an action on a level.

a. Level 1: Visceral Level
    - Initial level of processing available information.
    - This level of design refers to the perceptible qualities of the object and how they make the user/observer feel..
    - The external look and touch of the product will dominate the user at this visceral level.
    - This design often refers to creating the best user interface and graphical appearance.
    - Once this level is approved we can proceed toward actual work.
    - If this level is not designed properly, other levels will need more effort for product acceptance.
b. Level 2: Behavioural Level
    - This is the more detailed level of product description than visceral.
    - The behavioural level essentially refers to the emotions we feel as a result of either accomplishing or failing to complete our goals.
    - In this level, semantics and usability practices are addressed and help decide the behaviour and feedback of the product.
    - For example, a dialog box with an error message informs the user about the next step of action.
    - ON and OFF marks on the electrical switch can simply explain its operation.
c. Level 3: Reflective Level
    - The final level of processing is analysis and reflection of all experiences is done in this level.
    - This level mainly deals with analysing past experiences and future requirements to plan for goals.
    - Then based on user preferences, we choose a method to execute the plan.

Q7. Describe Human - Centred Design with example.

Ans:

- Human centred design is a practice where designers focus on system users' human needs.
- This type of design will consider all aspects of targeted users as per their interests, behaviours, skillset, experiences, challenges, etc, and makes the products that are simple for the user to operate.
- Human characteristics are studied for product design and the main goal of such a system is user satisfaction.
- Every user will have some different experience with the real world system and their intelligence will use this experience to learn new features.
- The goal of the designer here is to find this knowledge of the user and use it to design the best possible interface.

- Example: Push and Pull parts of the door are fitted with a handle, this creates confusion in your brain. The push part of the door doesn't need a handle. Design a door with handles only in the Pull side of the door. Leave the push side with a plain pad. We all will push the door automatically if we don't see a handle.

Q8. Ergonomics:
Ans:

- It means designed for efficiency and comfort in the working environment.
- Studies of interface have focussed on user's perceptual, cognitive, motor skills rather than social or behavioural factors.
- The challenge for interface designers is to design systems whose interaction with users will induce the latter to form mental models similar to the system's conceptual model.