Question Bank – UNIT IV

Q1. What are human factors in VR and AR?
A: Human factors in VR and AR refer to the **physiological, psychological, and ergonomic** considerations that affect user experience, including **vision, hearing, and body movement perception**.

Q2. How does the human eye impact VR experiences?
- The human eye perceives depth through **binocular vision**, which VR headsets replicate using **stereoscopic displays**.
- The **field of view (FOV)** in VR headsets mimics natural vision for realism.
- **Latency and refresh rates** affect eye comfort and motion sickness.

Q3. Why is the ear important in VR?
- The ear helps in **3D spatial audio perception**, enhancing immersion.
- **Binaural audio processing** enables users to identify the direction of sounds.
- VR systems use **head-related transfer functions (HRTF)** to mimic real-world sound positioning.

Q4. What are the somatic senses, and why are they important in VR?
A: The **somatic senses** include **touch, temperature, proprioception (body awareness), and pain**. They are important in VR for:
- **Haptic feedback** (vibrations, force feedback).
- **Motion tracking** for hand and body movements.
- **Immersive user experiences** using gloves or bodysuits.

Q5. What are the key hardware components of a VR system?
1. **Sensor Hardware** – Tracks movement and orientation.
2. **Head-Coupled Displays (HCDs)** – Display visuals that respond to head movements.
3. **Acoustic Hardware** – Produces spatial audio for immersion.
4. **Integrated VR Systems** – Combine **processing, tracking, and display** into a single unit.

Q6. What is the function of sensor hardware in VR?
A: Sensor hardware **tracks user movements** and includes:
- **IMU Sensors (Accelerometer, Gyroscope, Magnetometer)** for head tracking.
- **Optical Tracking** using cameras or infrared sensors.
- **Hand and body tracking** for gesture-based interaction.

Q7. What are Head-Coupled Displays (HCDs)?
A: HCDs are **displays that move with the user's head** to adjust the virtual perspective dynamically. Examples include VR headsets like **Oculus Quest, HTC Vive, and PlayStation VR**.

Q8. How does acoustic hardware enhance VR experiences?
- Uses **3D spatial audio** for realistic sound perception.
- Implements **directional and positional sound cues**.
- Helps users **navigate VR environments using sound**.

Q9. What are Integrated VR Systems?
A: These systems **combine all VR hardware elements** (display, sensors, computing, and tracking) into a single device, such as **Oculus Quest and Microsoft HoloLens**.

Q10. What are the key software components in VR?
1. **Modelling Virtual Worlds** – Creating 3D environments.
2. **Physical Simulation** – Simulating physics-based interactions.
3. **VR Toolkits** – Pre-built libraries and SDKs for VR development.
4. **VRML (Virtual Reality Modeling Language)** – A language for describing VR content.

Q11. What is the role of modelling in virtual world creation?
- Defines the **geometry, textures, and animations** of virtual objects.

- Uses **3D modeling software** like **Blender, Maya, and Unity**.
- Creates **interactive elements and realistic environments**.

Q12. What is physical simulation in VR?
A: Physical simulation refers to **realistic interactions between objects and users**, including:
- **Gravity and physics-based movements**.
- **Collision detection**.
- **Haptic responses for touch interactions**.

Q13. What are VR toolkits, and why are they important?
A: VR toolkits provide **pre-built functionalities** for faster development. Examples include:
- **Unity3D and Unreal Engine** for game development.
- **Google VR SDK** for mobile VR applications.
- **Microsoft Mixed Reality Toolkit (MRTK)** for AR/VR projects.

Q14. What is VRML (Virtual Reality Modeling Language)?
- **VRML is a standard file format for representing 3D interactive worlds**.
- It enables **web-based VR applications**.
- It supports **animations, lighting, and user interactions**.

Q15. How do VR and AR software frameworks differ?

Feature	VR Software	AR Software
Output Device	Headset or Display	Transparent Display (HMD) or Mobile
Interaction Type	Fully Immersive	Overlays Digital Content on Reality
Example	Oculus SDK, Unreal Engine	ARKit (Apple), ARCore (Google)

Q16. What are some real-world applications of VR development tools?
- **Gaming & Entertainment** – Unity & Unreal Engine for game design.
- **Medical Training** – VR simulations for surgical procedures.
- **Architecture & Engineering** – 3D VR models for design visualization.