Question Bank – UNIT II

Q1. What is Augmented Reality (AR)?
A: Augmented Reality (AR) is a technology that overlays digital information (images, videos, sounds) onto the real-world environment, enhancing user perception.

Q2. What is Mixed Reality (MR)?
A: Mixed Reality (MR) is an advanced form of AR that blends virtual and real environments, allowing digital objects to interact with the physical world in real-time.

Q3. How does AR differ from Virtual Reality (VR)?
A:

- **AR** enhances the real world with digital content.
- **VR** creates a fully immersive virtual environment, replacing the real world.

Q4. What are some examples of AR applications?
A:

- **Gaming** – Pokémon GO
- **Retail** – Virtual try-ons (IKEA Place, Sephora Virtual Artist)
- **Healthcare** – AR-assisted surgery (AccuVein)
- **Education** – Interactive learning (Google AR in classrooms)
- **Navigation** – Google Maps AR

Q5. What are the different types of Augmented Reality?
A:

1. **Marker-based AR** (Image Recognition)
2. **Markerless AR** (Location-based AR)
3. **Projection-based AR**
4. **Superimposition-based AR**

Q6. What is meant by Taxonomy in AR?
A: Taxonomy in AR refers to the classification of AR based on its interaction, device type, and application area.

Q7. What are the primary technologies used in AR?
A:

- **Computer Vision** – Recognizes real-world objects
- **SLAM (Simultaneous Localization and Mapping)** – Tracks environment changes
- **Depth Sensing** – Measures distance for realistic placement
- **AI & Machine Learning** – Enhances user interaction

Q8. What role does SLAM play in AR?
A: SLAM helps AR devices understand the real-world environment by mapping surroundings and tracking user movement in real-time.

Q9. What is LiDAR, and how is it used in AR?

A: LiDAR (Light Detection and Ranging) scans real-world objects and measures depth, improving AR object placement and realism.

Q10. Name some popular AR development platforms.

- **ARKit** (Apple)
- **ARCore** (Google)
- **Vuforia**
- **Wikitude**
- **Microsoft HoloLens SDK**

Q11. What are Marker-based and Markerless AR?

- **Marker-based AR** uses a predefined image (marker) to trigger AR content.
- **Markerless AR** relies on GPS, accelerometers, and sensors to place AR content.

Q12. What are Projection-based AR and Superimposition-based AR?

- **Projection-based AR** projects digital images onto real surfaces.
- **Superimposition-based AR** replaces parts of the real-world view with AR elements.

Q13. What is Holographic AR?

A: Holographic AR creates 3D holograms that interact with real-world objects (e.g., Microsoft HoloLens).

Q14. What are the essential steps in developing an AR application?

1. Environment Scanning
2. Image Recognition
3. Real-time Rendering
4. Interaction Handling
5. Performance Optimization

Q15. What factors affect AR compatibility with the environment?

- **Lighting Conditions** – Affects object detection
- **Surface Quality** – Influences AR object placement
- **Device Sensors** – Determines tracking accuracy

Q16. How does AR adapt to dynamic environments?

A: By using AI, SLAM, and depth sensors to recognize and track changes in surroundings.

Q17. What are some challenges in ensuring AR content interacts naturally with the real world?

- **Occlusion Handling** – AR objects should hide behind real objects if necessary.
- **Shadows & Reflections** – Must match real-world lighting.

Q18. What are the key components of AR system architecture?

1. **Input System** – Sensors, Cameras
2. **Processing Unit** – Computer vision, AI algorithms
3. **Rendering System** – 3D graphics engine
4. **Output System** – Display devices (HMDs, smartphones)

Q19. What is an AR Display, and what types exist?
A: AR Displays present augmented content. Types include **Optical See-Through HMDs, Video See-Through HMDs, and Handheld Displays**.

Q20. How does Cloud AR differ from local AR?
A: Cloud AR offloads processing to cloud servers, enabling high-quality experiences on mobile devices.

Q21. Define the term 'Augmented Reality Overlay.'
A: A digital layer placed over real-world objects in AR applications.

Q22. What is Spatial Computing?
A: The interaction between digital and physical spaces using AR, VR, and AI.

Q23. What is an AR SDK?
A: A Software Development Kit (SDK) for building AR applications (e.g., ARCore, ARKit, Vuforia).

Q24. List five industries using AR technology.
1. **Healthcare** – AR-assisted surgeries
2. **Retail** – Virtual try-on experiences
3. **Automotive** – AR dashboards
4. **Education** – Interactive learning
5. **Manufacturing** – AR maintenance assistance

Q25. How does AR improve navigation?
A: AR overlays directional arrows on real-world paths, enhancing GPS-based navigation (e.g., Google Maps AR).

Q26. What role does 5G play in AR?
A: Faster data transfer, reduced latency, and improved real-time rendering for cloud-based AR experiences.

Q27. How do IoT and AR work together?
A: IoT sensors provide real-time data to AR applications, improving smart city management and remote monitoring.

Q28. What is the role of edge computing in AR?
A: Processes AR data closer to the user, reducing latency and improving performance.

Q29. What are the biggest challenges in AR development?
- **Hardware Limitations** – Requires high-performance devices
- **User Experience** – Motion sickness, eye strain
- **Privacy Issues** – AR collects real-world data

Q30. How can AR overcome occlusion issues?
A: By using depth sensors, LiDAR, and AI-powered object recognition.

Q31. What are the main methods of implementing AR?

1. **Marker-based AR**
2. **Markerless AR**
3. **SLAM-based AR**
4. **Projection AR**

Q32. What is WebAR?

A: Web-based AR that runs in a browser without requiring app installation.