

Question Bank – UNIT I: INTRODUCTION TO VR

1. Introduction to Virtual Reality

Q1. What is Virtual Reality (VR)?

A: Virtual Reality (VR) is a simulated environment that immerses users in a 3D interactive world using computer technology, typically experienced through headsets and motion-tracking devices.

Q2. How does VR differ from Augmented Reality (AR)?

A: VR creates a completely immersive digital world, while AR overlays digital objects onto the real-world environment using devices like smartphones or AR glasses.

Q3. List some real-world applications of VR.

A: VR is used in gaming, healthcare (surgical training, therapy), education (virtual classrooms), architecture (3D visualization), and military training (flight simulation).

Q4. What are the key characteristics of an immersive VR experience?

A: Immersion, interactivity, realism, real-time rendering, and sensory feedback.

Q5. What is the primary goal of Virtual Reality?

A: To create an artificial environment that feels real to the user through visual, auditory, and sometimes haptic interactions.

Q6. Who is considered the pioneer of Virtual Reality?

A: Ivan Sutherland, who developed the first head-mounted display (HMD) system in the 1960s.

Q7. What was the first VR system ever developed?

A: The **Sensorama** (1957) by Morton Heilig, a multi-sensory simulator.

Q8. How did VR evolve from the 1960s to the present?

A: Early mechanical simulators → 1960s HMDs → 1980s NASA VR systems → 1990s consumer VR → 2010s modern VR headsets (Oculus Rift, HTC Vive, etc.).

Q9. What was the significance of the Sensorama in VR history?

A: It was one of the first multi-sensory immersive experiences, combining visuals, sound, and even smells.

Q10. When did the term "Virtual Reality" first become widely recognized?

A: In the 1980s, coined by **Jaron Lanier**, founder of VPL Research.

Q11. What are the fundamental components of a Virtual Reality system?

A: Hardware (HMDs, sensors, input devices), Software (3D engines, VR applications), and User Interaction elements.

Q12. Explain the role of head-mounted displays (HMDs) in VR.

A: HMDs provide stereoscopic 3D visuals, tracking user movement to create immersive experiences.

Q13. What is haptic feedback, and why is it important in VR?

A: Haptic feedback uses vibrations or forces to simulate touch, enhancing realism in VR interactions.

Q14. What is the function of motion tracking in a VR system?

A: It detects user movements and translates them into the virtual world, improving immersion.

Q15. How does 3D audio enhance the VR experience?

A: It simulates directional sound, making users feel as if sounds originate from different points in the virtual world.

Q16. List the primary features of Virtual Reality.

A: Immersion, interactivity, sensory feedback, real-time simulation, and spatial tracking.

Q17. How has VR technology advanced in recent years?

A: Improved resolution, reduced latency, wireless VR, AI integration, and full-body tracking.

Q18. What are some modern VR devices available today?

A: Oculus Quest, HTC Vive, PlayStation VR, Valve Index, and Microsoft HoloLens.

Q19. What role does Artificial Intelligence (AI) play in VR development?

A: AI enhances VR by enabling realistic NPC interactions, adaptive environments, and predictive user behavior.

Q20. What are some of the latest trends in VR technology?

A: Wireless VR, eye-tracking, AI-driven virtual assistants, and metaverse integration.

Q21. Why are computer graphics essential for VR?

A: They create realistic environments, enhancing immersion and interactivity.

Q22. What is the difference between 2D and 3D graphics in VR?

A: 2D graphics lack depth, while 3D graphics create immersive, interactive spaces.

Q23. What is the significance of rendering techniques in VR?

A: Rendering determines how realistic and responsive VR visuals appear.

Q24. Explain how shading and lighting affect a VR environment.

A: They add realism by simulating how light interacts with surfaces.

Q25. What is the role of real-time rendering in VR applications?

A: It enables instant graphical updates to match user actions, preventing motion sickness.

Q26. What is meant by real-time computer graphics?

A: Graphics rendered instantly in response to user actions.

Q27. How does frame rate (FPS) impact VR experiences?

A: Higher FPS (90-120Hz) ensures smoother, more immersive experiences and reduces motion sickness.

Q28. Why is low-latency rendering important for VR?

A: Reduces motion lag, preventing nausea and improving realism.

Q29. What are the challenges in achieving real-time graphics for VR?

A: High computational power, low-latency rendering, and realistic physics simulation.

Q30. How do GPU advancements contribute to real-time VR graphics?

A: Modern GPUs enhance VR by processing complex 3D environments faster.

Q31. What is flight simulation, and how does VR enhance it?

A: VR-based flight simulators train pilots in a risk-free virtual environment with real-world physics.

Q32. What are the benefits of using VR in pilot training?

A: Cost-effective, risk-free, and highly immersive training.

Q33. How do motion platforms contribute to flight simulation?

A: They replicate real aircraft movements, enhancing realism.

Q34. What are some well-known flight simulators that use VR?

A: Microsoft Flight Simulator, X-Plane VR, and Aerofly FS.

Q35. How does VR-based flight simulation improve situational awareness?

A: It allows pilots to practice emergency scenarios in a realistic setting.

Q36. What are the key requirements for creating a virtual environment?

A: High-resolution graphics, real-time tracking, interaction capabilities, and sensory feedback.

Q37. Why is interactivity an essential feature of VR environments?

A: It enables users to engage with the virtual world naturally.

Q38. What is the importance of spatial audio in VR?

A: It provides directional sound cues, improving realism.

Q39. What are the challenges in designing realistic VR environments?

A: Computational demands, rendering latency, and user comfort.

Q40. How does user input affect the virtual environment?

A: It determines how users interact with and navigate the virtual space.

Q41. What are the major benefits of VR?

A: Enhanced training, entertainment, medical applications, and architectural visualization.

Q42. How does VR improve education?

A: It offers immersive learning experiences, making concepts easier to understand.