

(3 hours)

Total Marks: 80

- N.B. 1. Question **No. 1** is compulsory
 2. Attempt any **three** questions from remaining five questions
 3. Assume suitable data if **necessary** and justify the assumptions
 4. Figures to the **right** indicate full marks

- Q1** Answer any four questions.
- A Define the terms Virtual Reality. Explain all the components of the definition in detail. **05**
 - B Explain six degrees of freedom. **05**
 - C What is a scene graph? Explain giving examples. **05**
 - D Explain the Software Engineering requirements that must be addressed when developing AR applications. Illustrate each requirement with an example. **05**
 - E Explain the applications of AR in education and medical fields. **05**
- Q2** A Perform the following transformations on a triangle PQR whose coordinates are P(3,3), Q(6,6), R(8,4). Specify the matrices used. **10**
- 1. Rotate the triangle by 45° .
 - 2. Reflect the triangle about the Y axis.
 - 3. Reflect the triangle about $X=Y$.
 - 4. Apply the scaling parameter 3 along X axis and 5 along Y axis.
 - 5. Apply the shear parameter of 2 along both the axes.
- B Explain calibration, tracking and registration with respect to AR in detail. **10**
- Q3** A What are the AR application requirements? Explain each one in detail giving examples. **10**
- B What is camera calibration? Explain the different camera calibration techniques in brief. **10**
- Q4** A Explain the yaw, pitch and roll in detail. **10**
- B What are the common symptoms of VR sickness? Explain each one briefly. **10**
- Q5** A Explain the architecture of the AR system. Explain each component in detail. **10**
- B What is tracking in AR? How are the tracking techniques categorized? Explain markerless tracking techniques in detail. **10**
- Q6** A Explain the following concepts with respect to auditory perception: **10**
- 1. Precedence effect
 - 2. Localization
- B What is sensor fusion? Explain competitive and cooperative sensor fusion. **10**