

**DECEMBER 2021: END SEMESTER ASSESSMENT (ESA) B TECH 5 SEMESTER****UE19CS315– FUNDAMENTALS OF AUGMENTED AND VIRTUAL REALITY**

Time: 3 Hrs Answer All Questions

Max Marks: 100

- Note: 1. Length of answers should be proportional to the marks allocated
2. Make all assumptions as necessary

1	a)	Construct a 2D hexagon with the help of GL_TRIANGLES Primitive. Ensure the colors of individual triangles are different. (Complete code is not required, display callback function should suffice)	8
	b)	Write down the Algorithm for Sierpinski Gasket	
	c)	Given the following 2D points, find the convex hull a(3.00,5.00), b(5.00,4.00), c(-4.00,-6.00), d(-1.00,10.00), e(1.00,-5.00), f(6.00,-3.00) g(8.00,-7.00), h(8.00,-9.00), i(3.00,2.00)	
2	a)	Given that the object is rotated by 40° around axis represented by unit vector (0.80, 0.53, 0.26). Represent the same rotation in the form of quaternions (w,x,y,z)	6
	b)	Given 2 complex numbers representing two rotations in 2 Dimension $0.86+i 0.5$ (30° rotation) $0.76+i 0.64$ (40° rotation) derive the resulting complex number that represents both rotations	4
	c)	Derive the Transformation Matrix for the following Transformations 1. Scale the object by a factor of 2 2. Rotate the Object by 45° around x-axis 3. Translate the object by 3, 2, and 1 unit in x, y, and z axes respectively The Transformations are in that order	10
3	a)	Differentiate between the two Methods of Augmentation OST and VST	7
	b)	In two sentences explain the various display methods for AR applications	7
	c)	Differentiate between Triangulation and Trilateration.	6

4	a)	What principle of the human visual system is applicable for the following scenarios? 1. The focus on the object is intact even when the person is walking, running, or jumping 2. Any 2 Factors that enable users to perceive depth 3. What is the principle in human visual system that governs 3D glasses? 4. Stereoscopic displays the same viewpoint in two separate screens, one for right and one for left. True or False 5. The field of View of a human eye is depended on the anatomy of individual person. True or false	7
	b)	What is the most appropriate definition of virtual reality? Name any 3 VR components	6
	c)	Among the following Trackers which is most appropriate for the below scenarios. Justify in one sentence Optical tracker, Electric Trackers, Ultrasonic Trackers, Inertial Trackers, Mechanical Trackers, Hybrid Trackers 1. Control a media player with the help of hand gestures 2. Train people with the help of virtual reality in physical fitness center 3. Enable interaction with flat screens to navigate through the user interface detect movements in a confined space.	7
5	a)	What is the design consideration for developing a interaction mechanism for VR	7
	b)	Analyze two issues with estimating the orientation of a rigid body? How do you mitigate those issues (Answer is two sentences only)	6
	c)	1. Which of the following devices enables Navigation/Manipulation in VR A) Audio Feedback system B) Haptic Feedback C) Head Mounted Device D) Pinch Gloves (2) 2. Differentiate between Natural Feature Tracking and Marker based Tracking with respective use cases (5)	7