SOUTHEAST UNIVERSITY

School of Science & Engineering/Department of CSE, Final Exam

Semester: Summer 2019 Program: BSc in CSE

Course Title: Computer Graphics & Animation

Course Code: CSE4013 Sec: 2, 4

Time: 120 Minutes **Full Marks: 40**

[You have to answer all of the questions given below. ☺]

No.	QUESTION	Marks
1.	a) We want to align a vector, $\overline{V}$= $\frac{1}{7}$ **i – 3j + 6k** with the vector i along the positive **X**-axis by performing two rotations about the principal axes.	1+3
	i) First we rotate by an angle **α** about the **Y** axis and then by an angle **β** about the **Z** axis. Find **α** and **β**.	
	ii) Find the composite transformation matrix to rotate all 3D objects by an angle of **30** degree with respect to $\overline{V}$. You don't need to multiply the matrices. Use homogeneous coordinates. You can use data from part one.	
	b) Suppose you have some 3D homogeneous points A (3, -9, 7, -1), B (0, -3, -7, 2) and C (4, 4, 4, 4).	2+2
	1. Find **(3$\overline{AB}$ - 2$\overline{CB}$ + 5$\overline{AC}$).**	
	2. Find **($\overline{AB}$. $\overline{CA}$).**	2
	c) What does mean the value of **w** in homogeneous co-ordinate? Draw necessary figures.	
2.	a) Find the transformation matrix of mirror reflection about the line **2x – 3y + 3=0**. You don't need to multiply the matrices. Use homogenous coordinates.	4
	b) Consider two straight lines L1 and L2, which are represented by the equations **x+y-6=0** and **x-y+4=0** respectively. You want to align L1 with L2 by performing 2D translation(s) and rotation(s). Write down the corresponding composite transformation matrix. You don't need to multiply the matrices. Use homogenous coordinates.	3
	c) Consider a 3D plane P, which is defined by the equation **y-z=0**. Determine the transformation matrix for reflection with respect to P. You don't need to multiply the matrices.	3

3.

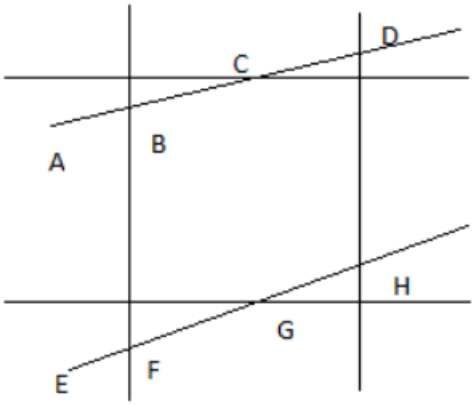


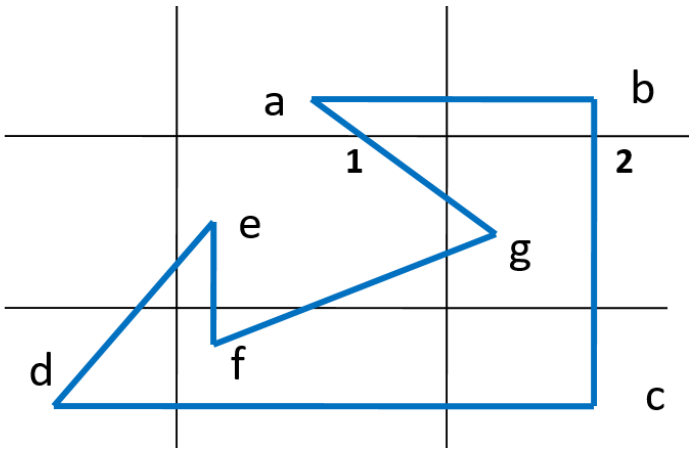
Fig-1

a) Inspect Fig-1 and answer the questions below. 5

i) Which portion will be selected to draw from line AD?

ii) Which portion will be selected to draw from line EH?

Use **Cohen-Sutherland** line clipping algorithm.



5

Fig-2

b) Inspect Fig-2 and fiind the resultant portion when clip on bottom, clip on right and clip on top have occurred. You have to use **Sutherland-Hodgman** polygon clipping algorithm.

4.

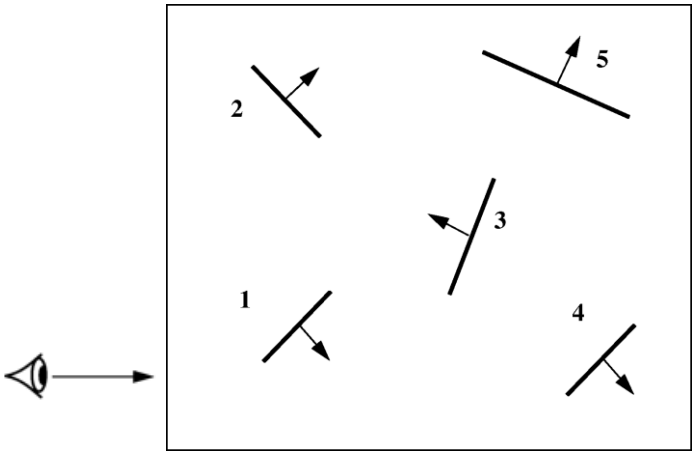


Fig-3

a) Inspect Fig-3 and answer the questions below. 4+1

i) Draw the BSP tree and take object 3 as root. Then display the BSP tree.

ii) Draw the BSP tree if you take object 5 as root.

b) Write down the invisible primitives for a polygon. 1

c) Write the advantages and disadvantages of Back-Face Culling algorithm. Draw figures if necessary. 2

d) Compare Image precision and Object precision algorithm. 2