Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: B.Tech **Semester: I**

Program: CSE- All Specializations **Time : 03 hrs.**

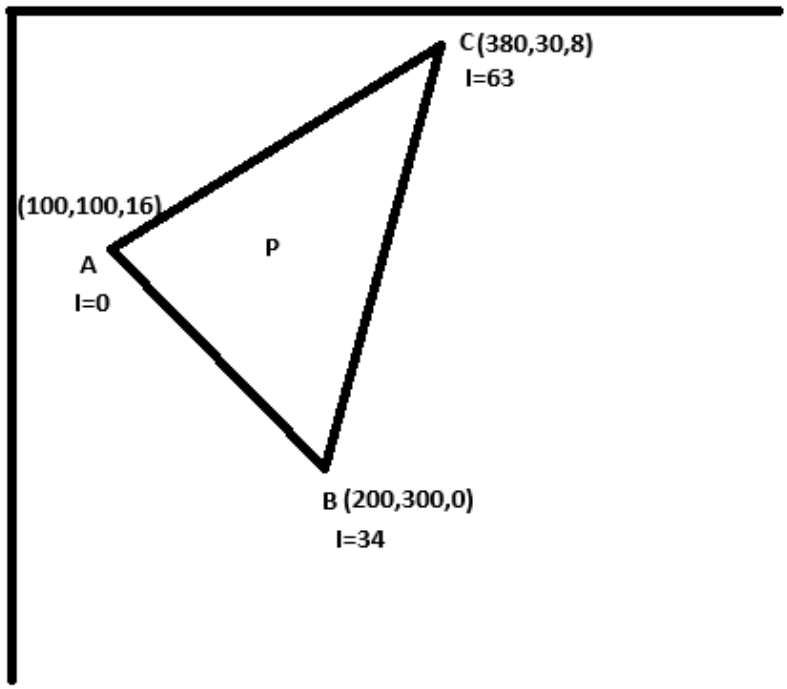
Course Code: CSEG3003 **Max. Marks: 100**

Instructions: Calculator is Allowed. Make necessary assumptions if any information is missing. There is an internal choice in question number 9 and question number 11.

SECTION A

(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between the object space and image space method of detecting visible surface, give examples for each.	**4**	**CO4**
Q2	The flat shading gives realistic effects or is valid if……. is at infinity or …… is at infinity.	**4**	**CO5**
Q3	Define Fractals, mention two important characteristics of Fractals.	**4**	**CO4**
Q4	Explain how one ensures that relative replacement in viewport is same as that of window.	**4**	**CO2**
Q5	Explain with example why 8-connected approach is needed for seed fill algorithms.	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q6	a. Is OpenGL platform Independent? Explain. b. What is meant by resolution of an image.	**5+5**	**CO1**
Q7	For the given figure, calculate the pixel value at the centroid P of the triangle using Gourard Shading approach. The Figure shows the coordinate values and the color intensities at the vertices of the triangle.	**10**	**CO5**

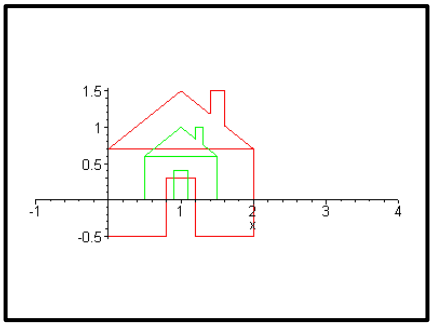
			
Q8	A computer graphics rendering system uses the Z-buffer algorithm to determine visible surfaces in a 3D scene. Consider a viewport of size 4×4 pixels with an initial Z-buffer value of +∞ for all pixels. The scene contains two triangles, T1 and T2, defined in screen space with their depth (Z-coordinate) values at the vertices as follows: 1. **Triangle T1:** o Vertices: V1= (1,1,0.5), V2= (3,1,0.3), V3= (2,3,0.4) o Color: Red 2. **Triangle T2:** o Vertices: V4= (2,2,0.2), V5= (3,2,0.4), V6= (2,4,0.3) o Color: Blue The triangles overlap in the screen space. The Z-buffer is used to compute visibility for each pixel. a. For each overlapping pixel, determine which triangle is visible based on their Z-values. b. Discuss two advantages and two limitations of the Z-buffer algorithm for visible surface detection.	**10**	**CO4**
Q9	Consider the following window coordinates A(100, 10), B(160, 10) C(160, 40), D(100, 40). Find the visible portion of the line segments EF, GH and IJ using Cohen Sutherland algorithm E (50,0), F(70,80), G(120, 20),H(140, 80),I(120, 5),J(180, 30).	**10**	**CO2**

<table>
<tr><td></td><td>OR
Clip the polygon defined by end coordinates A(5,105), B(90,220), C(220,105), D(90,105), E(300,0), F(40,0), G(40,10) and H(20,10) using Sutherland Hodgeman Polygon clipping, clipping coordinates of the window are X_{min}= 10 , Y_{min}= 10 X_{max}= 200 , Y_{max}= 200. Discuss in detail all the steps involved in clipping and mention the drawbacks associated with this approach.</td><td></td><td></td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q10</td><td>a. Validate if the following knot vector is valid for a cubic B-spline with 5 control points: U=[0,0,0,1,2,3,3,3].

b. An airplane's landing trajectory is modeled using a cubic beizer curve. The control points are:

<table><tr><td>X</td><td>0</td><td>20</td><td>40</td><td>60</td></tr><tr><td>Y</td><td>50</td><td>40</td><td>20</td><td>0</td></tr></table>
Find the airplane's altitude at t=0.25

c. Establish relationship between blending function, parameter and geometic vector for a four degree beizer curve.</td><td>4+8+8</td><td>CO4</td></tr>
<tr><td>Q11</td><td>a. Locate the position of the triangle A(2,4) B(4,6) and C(2,6) after its reflection about a line x-2y=-4.
b. State briefly how following transformations occurs, in the given figure green one is original figure and red one is transformed one.

OR
Rotate a cube with following vertices A(2 1 2) , B(3 1 2) , C(3 1 1) ,D(2 1 1) , E(2 2 2) , F(3 2 2) G (3 2 1) H(2 2 1) about its diagonal(FD) pointing away from the original by 45 degrees.</td><td>16+4

20</td><td>CO3</td></tr>
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