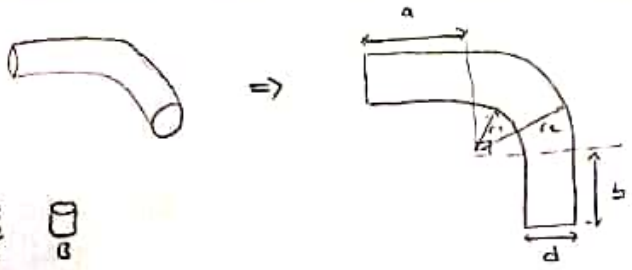
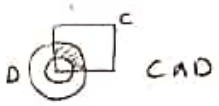
## soru 4




top down view



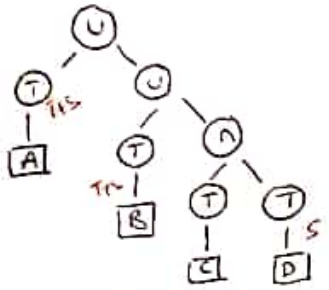

2 silindir — A, B

1 box — C

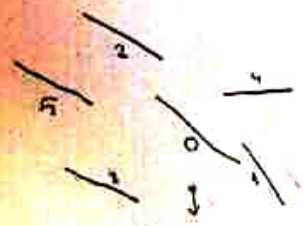
1 simit — D

T: Transformation

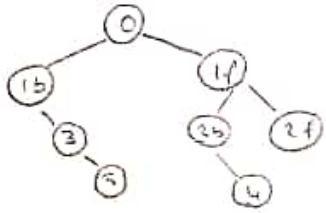
union ( T(A), T(B), intersection T(C), T(D) )




## soru 5




a-



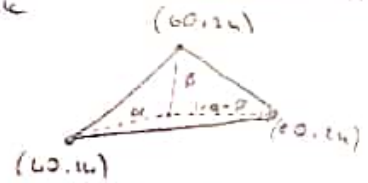

25, 4, 14, 24, 0, 15, 3, 5

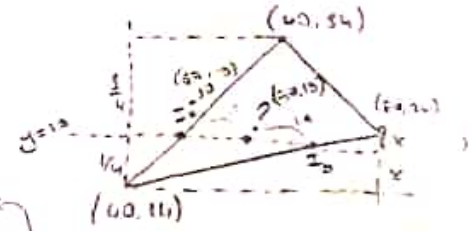
## soru 6

$I_1 = I(40,16) = 10$

$I_2 = I(60,24) = 30$

$I_3 = I(80,24) = 140$




$\frac{2}{3} \cdot 30 + \frac{1}{3} \cdot 99 = 45 = I_b$

$\frac{1}{6} \cdot 10 + \frac{1}{4} \cdot 30 = 30 = I_a$

$I_a = (45, 18)$

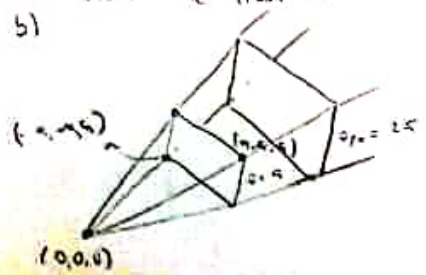
$I_b = (60, 18)$

## Grafik

1- suppose a perspective projection is given by gl.frustum $(-\pi, \pi, -\pi, \pi, \pi, 25)$ (x ekseni, y ekseni, z ekseni)

a) sketch the frustum in 3D.

b)




---

Q2)


C1 continuity

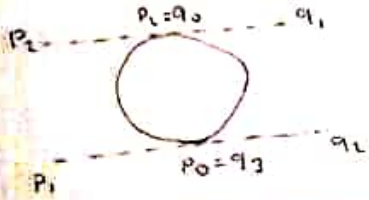
$P_0 = q_0 \wedge P_3 = q_3$

veya

$P_0 = q_3 \wedge q_0 = P_3$

$P_1, P_2 = q_3, q_2$ should all lie on the same line

similarly, $P_2, P_3 = q_0, q_1$ should all be on the same line.

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Q3- $I_L = 0.6$ parlaklık seviyesi

Ambient $L = (0.7, 0.7)$ ışığa doğru → yüzeyin ışığa göre konumu

$$I_D = K_A \cdot I_A + K_D \cdot I_L (N.L) + K_S I_L (R.V)^{n_s}$$

$$= 0.05 + 0.8 (N.L) + 0.12 (R.V)$$

$1.4\sqrt{0.5}$ — $q_7$

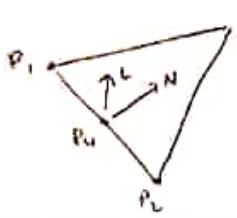

$\frac{a}{a+b} = r$ olsun

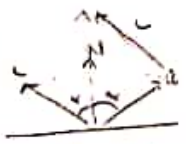
iki N 'yi toplayıp 2'ye bölünce = N

$$r \cdot N_1 + (1-r) N_2 = \bar{N}_4 = \begin{pmatrix} 0 \\ 0.5 \\ 0.5 \end{pmatrix}$$

$$|\bar{N}_4| = \sqrt{0.5^2 + 0.5^2} = \sqrt{0.5}$$

$$N_4 = \frac{\bar{N}_4}{|N_4|} = \begin{pmatrix} 0 \\ \frac{0.5}{\sqrt{0.5}} \\ \frac{0.5}{\sqrt{0.5}} \end{pmatrix}$$




$2(L.N).N - L$

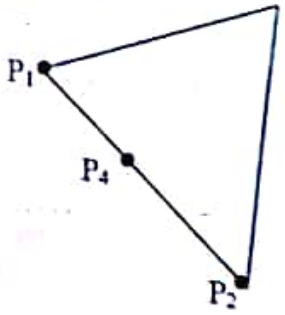
$$2.8.\sqrt{0.5} \begin{pmatrix} 0 \\ \frac{0.5}{\sqrt{0.5}} \\ \frac{0.5}{\sqrt{0.5}} \end{pmatrix} - \begin{pmatrix} 0 \\ 0.7 \\ 0.7 \end{pmatrix} = \begin{pmatrix} x_R \\ y_R \\ 0.7 \end{pmatrix} = R$$

Vhat is z-buffer and what is it used for? [4]
low does the Z-buffer work? Explain the algorithm. [6]
xplain the advantages and disadvantages of using the Z-buffer method. [5]
Can you name another method for the same problem? Compare and contrast these two
hods. [5]

ordinate values of the points in the following figure are given as $P_1$=(1,2), $P_2$=(5,0), $P_4$=(3,1)
mal vectors on the points $P_1$ and $P_2$ should be taken as $\overrightarrow{N_1} = (0,1,0)$ and $\overrightarrow{N_2} = (0,0,1)$.

other parameters are given as follows:
), $\vec{L} = (0,0.7,0.7)$, $I_L$=0.6, $K_a$=0.1, $I_a$=0.5, $K_d$=0.5, $K_s$=0.2, $n_s$=1,

d the illumination intensity at the point $P_4$ using Basic (Phong / Blinn) illumination model
polygon rendering (shading) method.




simple WebGL application that will display a pyramid shape on screen. Each face of the
ould be in different color.

# COM337 2018-2019 BÜTÜNLEME SORULARI

- Sutherland-Hodgeman
- BSP tree construction and traversal
- Rotation
- Bresenham's Approach
- Code line explanation
- Write a pseudocode to divide a convex polygon into non-intersecting triangles

University
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ter Graphics
n: 100
t ID:

Department of Computer Engineering
09/01/2019
Examination

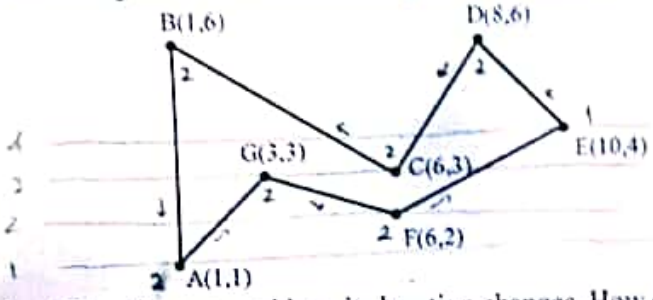
Name Surname:

| Question | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Marks | 15 | 15 | 15 | 20 | 15 | 20 |

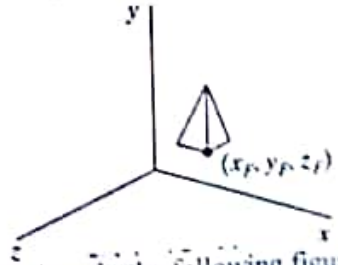
r the given polygon below:

a) Write the contents of the sorted edge table for the given polygon. Assume the scan conversion starts from the bottom scan line. [9]

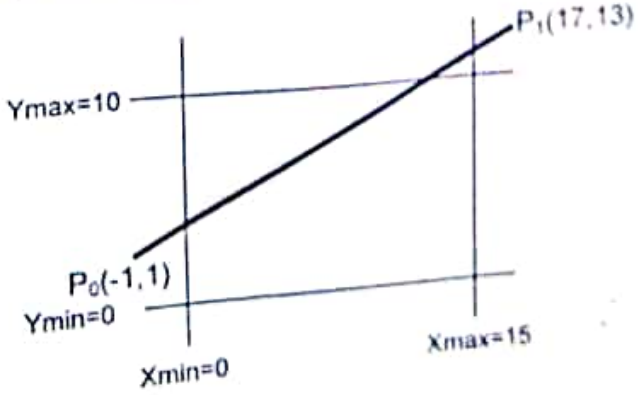
b) Which edges are in the Active Edge List at scan line 4? [6]




When we apply a 3D scaling to an object, its location changes. How do we scale an object relative selected fixed point? Give the final transformation matrix to scale the object below relative to the nt $p(x_F, y_F, z_F)$. The scaling factors are $s_x, s_y, s_z$.




3 The clipping window and a line are given in the following figure. Apply Liang-Barsky line clipping gorithm. Describe the steps of the algorithm, show how the decisions are made, and how the final sult is calculated.



# COM337 Final Soruları

- Scan conversion (sorted edge list + active edge list)
- Scaling relative to a fixed point
- Liang-Barsky
- Z-Buffer
- Phong/Blinn Illumination Model
- WebGL Pyramid code with different colors

Com 337 Vize 2018-2019

- Pipeline
- Primitives
- Attrib v4 vPosition
- Girilen a ve d ye gore deltaX'i değiştir

**Q1.** Suppose a perspective projection is given by glFrustum (-5, 5, -5, 5, 5, 25).

a) Sketch the frustum in 3D.

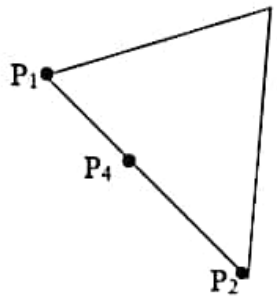
b) If eye position is at P(0, 0, 0), what is the coordinates of the point $P_{prp}(3, 3, 7)$ on the projection plane.

**Q2.** Two Bezier curves are given with control point $p_0$, $p_1$, $p_2$, $p_3$ and $q_0$, $q_1$, $q_2$, $q_3$. What conditions should be met to join these two curves to have a circular closed curve? Sketch the final curve and show the control points.

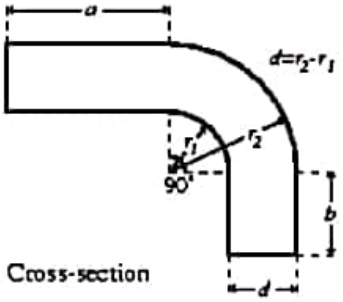
**Q3.** The coordinate values of the points in the following figure are given as $P_1=(1,2)$, $P_2=(5,0)$, $P_4=(3,1)$ and the normal vectors on the points $P_1$ and $P_2$ are given as $N_1=(0,1,0)$ and $N_2=(0,0,1)$, respectively.

The other parameters are given as follows:
$V=(0,0,1)$, $L=(0,0.7,0.7)$, $I_L=0.6$, $K_a=0.1$, $I_a=0.5$, $K_d=0.5$, $K_s=0.2$, $n_s=1$,

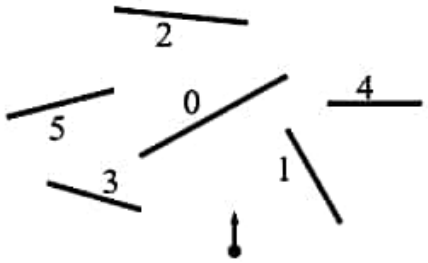
Find the illumination intensity at the point $P_4$ using Phong shading model.




**Q4** Work out how to represent the following object using constructive solid geometry (CSG). You may assume the following primitives whose parameters can be set: sphere, cylinder, cone, torus, box (cuboid). Describe your construction method, detailing the operations on the primitives: Draw a labelled binary tree to illustrate the processing of the primitives (leaf nodes) to create the final object (root node)




**Q5** **(a)** Construct the binary space partition tree for the line segments shown below, adding the objects to your tree in numerical order.
Note: Use the convention that the number identifier is on the front of the line segment, and segments to the front side of a segment will be represented by the right sub-tree of the corresponding node in the BSP tree.
**(b)** Show the traversal order of the BSP tree given the eye point shown with a dot and arrow in the picture. Show intermediate stages of computation of the traversal.




**Q6** Consider a triangle in the image plane. The intensities I(x,y) at the three vertices are

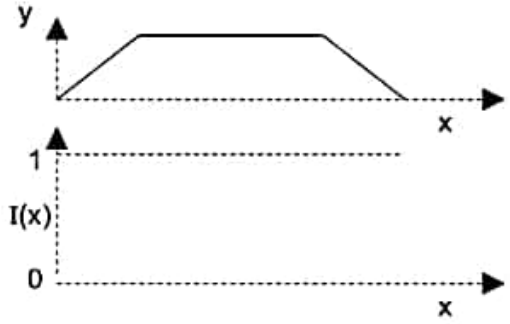
$I1 = I(40, 14) = 10$
$I2 = I(60, 34) = 90$
$I3 = I(80, 24) = 140$

(a) Using Gouraud shading, calculate the intensity at the point (50,19), i.e. I(50, 19).
(b) Describe how you could modify your method in order to calculate the intensities using Phong shading?

**Q7** The top part of the diagram below represents the cross section of a surface, with light source and viewing position. On the graph template below it sketch the ambient, diffuse, and specular illumination as functions of x. Assume the Phong illumination model, i.e.

$I = k_a I_a + k_d I_d (N.L) + k_s I_s (R.V)^n$,

where $k_a = 0.2$, $k_d = 0.6$, $k_s = 0.6$, $I_a = I_d = I_s = 1.0$, $n = 300$.


**Q8.** a) Given the following function call to gluPerspective:

gluPerspective(60.0,0.8,4.0,100);

where the first parameter is the viewing angle, the second parameter is the aspect ratio of the clipping window (width/height), the third parameter is the distance of the near plane to the viewing origin, and the forth parameter is the distance of the far plane to the viewing origin. Find the glFrustum parameters:

glFrustum (xwmin, xwmax, ywmin, ywmax, dnear, dfar)

c) How can we obtain an oblique perspective projection using glFrustum function?



**Q9.** Briefly explain how we apply ray casting algorithm to calculate the volume of an object in the scene? Assume the rays are parallel to z axis and a pixel has a unit area $A_{ij}$ .

**Q10.** What is a-buffer? How can we handle transperent objects in a scene and antialising by using a-buffer?