INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, ALLAHABAD

C1 Assessment, 14 September 2022.

Graphics & Visual Computing IGVC-5211

B.Tech - IT: V - Semester

Full Marks - 10. **Time - 1.5hrs.**

Answers should be brief and to the point. Marks will be deducted for unnecessary writing. Calculators are allowed.

1. Consider an arbitrary line whose equation is given below:

$$y = \frac{1}{2}(x + 6)$$

The position vectors describe the vertices of a triangle **ABC**:

A[2 5 1], **B[4 7 1]** and **C[2 7 1]**.

Find the reflection of the triangle through this line by giving proper explanation and coordinates of the new triangle **A'B'C'**.

You have the following Functions which transforms the vertex **P[*x y z*]** to **P'[x' y' z']** at your Disposal:

Rotate_Z(Theta, P[*x y z*], P[x' y' z']) : Rotation by an angle θ

$x' = x\cos(\theta) - y\sin(\theta)$; $y' = x\sin(\theta) + y\cos(\theta)$; $z' = z$

Translate_Y(Ty, P[*x y z*], P[x' y' z']) : Translates **P[*x y z*]** by **Ty** :

$x' = x$; $y' = y - Ty$; $z' = z$

x'=x, y'=y-Ty and z'=z.

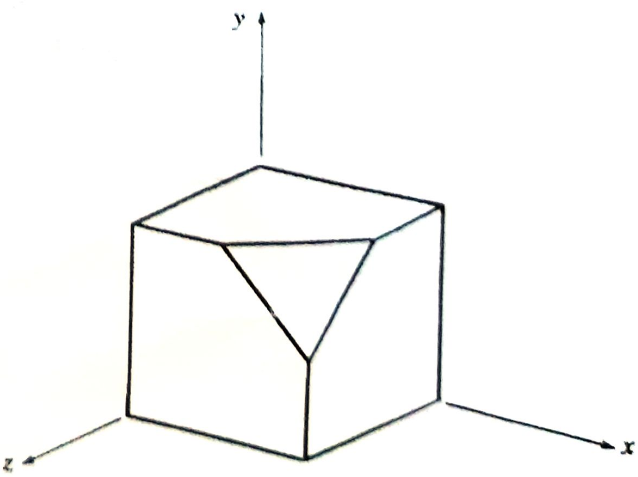
Reflect_X(P[*x y z*], P[x' y' z']) Reflection around x-axis

$x' = x$; $y' =- y$; $z' =- z$;

Write a pseudo code to reflect the triangle ABC by the line. **[3+2=5]**

2. Let the position vector of the cube with one corner removed are:

$$[X] = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 0.5 & 1 & 1 \\ 0.5 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 0.5 & 1 \end{bmatrix}$$



Get the trimetric projection of this cube by first rotating it by a $\Phi = 45^0$ about ***y-axis***, followed by a $\Theta = 45^0$ rotation about ***x-axis***, and then parallel projection onto the ***z=0*** plane. Also find the foreshortening factors ***fx***, ***fy*** and ***fz***.

If we would like to draw the above cube using **DDA**, write the pseudo code to display the object on the projection plane ***z=0***. (It is required to write the **DDA** Code) **[3+2=5]**