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1. In Diffuse Reflection given the value of Ip=10. Kd=0.5 and angle between the $\vec{L}$ and $\vec{n}$ vector is 120 degree. Find out the value of Diffuse Reflection (D). (4)

$D = I_p k_d \max(\cos\theta, 0)$

$= 10 \times 0.5 \max(-\frac{1}{2}, 0)$

$= 0$

2. In Specular Reflection 2 vectors $\vec{V}$ and $\vec{R}$ is given.
$\vec{V} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\vec{R} = \hat{i} + 2\hat{j} + \hat{k}$.
Find out the value of cos (α). [Here α means the angle between the vector $\vec{V}$ and $\vec{R}$] (7)

$\vec{V} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ $\quad \vec{R} = \hat{i} + 2\hat{j} + \hat{k}$

$\vec{V} \cdot \vec{R} = 2 + 6 + 5 = 13$

$|\vec{V}| = \sqrt{2^2 + 3^2 + 5^2} = 6.16$

$|\vec{R}| = \sqrt{1^2 + 2^2 + 1^2} = 2.45$

$\cos(\alpha) = \hat{V} \cdot \hat{R} = \frac{\vec{V} \cdot \vec{R}}{|\vec{V}| \cdot |\vec{R}|} = \frac{13}{6.16 \times 2.45}$

$= 0.861$

3. Write the Orthographic Projection Matrix if we project the (x,y,z) point on ZX plane where y=-5. [No Derivation required just write the matrix of 4*4 shape] (3)

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$$\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -5 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix} \begin{vmatrix} x \\ y \\ z \\ 1 \end{vmatrix} = \begin{vmatrix} x \\ -5 \\ z \\ 1 \end{vmatrix}$$ (Ans)

4. Suppose a Oblique Projection on xy plane where z=0. Given, Φ=30 degree and α=60 degree. Input point is A (3, 5, 7) Find out the new co-ordinate of point A after projection. [Use Oblique Projection matrix to solve the math] (6)

b

$$\begin{vmatrix} 1 & 0 & \frac{\cos\phi}{\tan\alpha} & 0 \\ 0 & 1 & \frac{\sin\phi}{\tan\alpha} & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix} \begin{vmatrix} 3 \\ 5 \\ 7 \\ 1 \end{vmatrix}$$

here,

$\phi = 30°$

$\alpha = 60°$

$$= \begin{vmatrix} 3+7\left(\frac{\cos 30}{\tan 60}\right) \\ 5+7\left(\frac{\sin 30}{\tan 60}\right) \\ 0 \\ 1 \end{vmatrix} = \begin{vmatrix} 6.5 \\ 7.02 \\ 0 \\ 1 \end{vmatrix}$$ (Ans)