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FALL 23

$ID = \dfrac{2}{A} \dfrac{130}{B} \dfrac{16}{C} \dfrac{10}{D}$

Quiz 2

1. $CMY = (0.10, 0.30, 0.21)$

$RGB = (1-0.1, 1-0.3, 1-0.21)$

$$= (0.9, 0.7, 0.79)$$
$$\quad\;\; R \qquad G \qquad B$$

HSV:

$\quad cmin = 0.7 \qquad cmax = 0.9$

$\quad D = 0.2$

① $V = 0.9 \times 100 = 90$

② $S = \dfrac{0.2}{0.9} \times 100 = 22.22$

③ $H = \dfrac{G-B}{D} = \dfrac{0.7-0.79}{0.2} = -0.45$

$H = -0.45 + 360 = 359.55$

$$\frac{Q}{}$$

Line : $9x - 9y + 423 = 0$

$$\Rightarrow \quad 9y = 9x + 423$$

$$\Rightarrow \quad y = x + \frac{423}{9}$$

$$\Rightarrow \quad y = x + 47$$

$$\theta = \tan^{-1}(1) = 45^0$$

$$b = 47$$

$M =$

$$\mathcal{R}_{(60°)} \times T_{(0,b)} \times R_{(\theta)} \times M_x \times R_{(-\theta)} \times T_{(0,-b)} \times T_{(D,c)}$$

$$= \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & b \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\times \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -b \\ 0 & 0 & 1 \end{bmatrix} \times$$

$$\begin{bmatrix} D & 0 & 0 \\ 0 & C & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos 60° & \sin 60° & 0 \\ -\sin 60° & \cos 60° & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 47 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos 45° & -\sin 45° & 0 \\ \sin 45° & \cos 45° & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\times \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos 45° & \sin 45° & 0 \\ -\sin 45° & \cos 45° & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -47 \\ 0 & 0 & 1 \end{bmatrix} \times$$

$$\begin{bmatrix} 10 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$P(30, 16, 10)$ $I_p = 70$

   • $L(0, 423, 8)$ $k_s = 0.9$
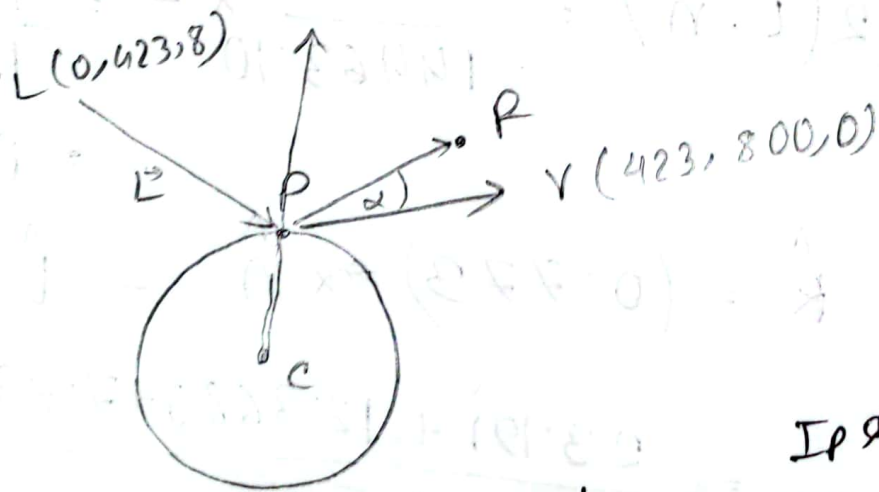
$v(423, 800, 0)$ $n = 9$ $c(0,0,0)$

(a)

$L(0, 423, 8)$ R $v(423, 800, 0)$

(b) Minimum intensity of light is 70

(c) $R = 2(\hat{L} \cdot \hat{n}) \hat{n} - \hat{L}$

$L = (0, 423, 8) - (30, 16, 10)$

$\quad = (-30, 407, -2)$

$\hat{L} = \dfrac{-30\hat{i} + 407\hat{j} - 2\hat{k}}{408.1}$

$\hat{n}:\ \vec{n} = P - C = (30, 16, 10) - (0, 0, 0)$

$$= (30, 16, 10)$$

$$\hat{n} = \frac{30\hat{i} + 16\hat{j} + 10\hat{u}}{2\sqrt{314}}$$

$$2(\hat{L} \cdot \hat{n}) = \frac{5592}{14463 \cdot 10} \times 2 = \frac{11184}{14463 \cdot 10}$$

$$= 0.773$$

$$\hat{R} = (0.773) \times \hat{n} - \hat{L}$$

$$= \frac{23.19\hat{i} + 12.368\hat{j} + 7.73\hat{u}}{2\sqrt{314}} - \frac{-30\hat{i} + 407\hat{j} - 2\hat{u}}{408.1}$$

$$= 0.654\hat{i} + 0.348\hat{j} + 0.21\hat{u} - (-0.073\hat{i} + 0.997\hat{j} - 4.9\times10^{-3}\hat{u})$$

$$= 0.727\hat{i} - 0.649\hat{j} + 0.2051\hat{u}$$

(d) $f_{att} = 1 - \left(\dfrac{d}{r}\right)^v$

$D = V - P = (423, 800, 0) - (30, 16, 10)$

$$= (393, 784, -10)$$

$|D| = \sqrt{(393)^v + (784)^v + (-10)^v}$

$$= 877.04$$

Now, $0.5 = \left(\dfrac{877.04}{r}\right)^v$

$\Rightarrow \dfrac{\sqrt{2}}{2} \times r = 877.04$

$\Rightarrow r = \dfrac{877.04 \times 2}{\sqrt{2}} = 1240.32$

(e)

$$I = I_p \, \mu_s \, \max(\hat{v} \cdot \hat{R}, 0)$$

$$\vec{v} = (423, 800, 0) - (30, 16, 10)$$

$$= (393, 784, -10)$$

$$\hat{v} = \frac{393\hat{i} + 784\hat{j} - 10\hat{u}}{877.09}$$

$$\hat{v} \cdot \hat{R} = \frac{-225.156}{877.09} = -0.256$$

$$I = I_p \, \mu_s \, \max(\hat{v} \cdot \hat{R}, 0)$$

$$= 70 \times 0.9 \times 0 = 0$$