Homework-2
EECS X493

Submitted by
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Prob 1

$$n^2(\lambda) = 2.555947 - 9.112305e{-3}\,\lambda^{2} + 1.706319e{-2}\,\lambda^{-2} - 3.920348e^{-4}\,\lambda^{-4} + 8.813931e{-5}\,\lambda^{-6} - 4.257410e{-6}\,\lambda^{-8}$$

(a) index at d wavelength $\lambda = 587.5618\ nm$
$= 0.5875618\ \mu m$

$\therefore$ $\boxed{n_d = 1.612693}$

F = 486.1327 nm
C = 656.2725 nm

(b) Dispersion across F-C band $= n_F - n_C$
$= 1.619970 - 1.609505$
$\boxed{= 0.010474}$

(c) Partial dispersion relative to D-C'

C' = 643.8469 nm
D = 587.2938 nm

$$= \frac{n_D - n_{C'}}{n_F - n_C} = \frac{1.6126 - 1.610013}{0.010474}$$

$$\boxed{= 0.246993}$$

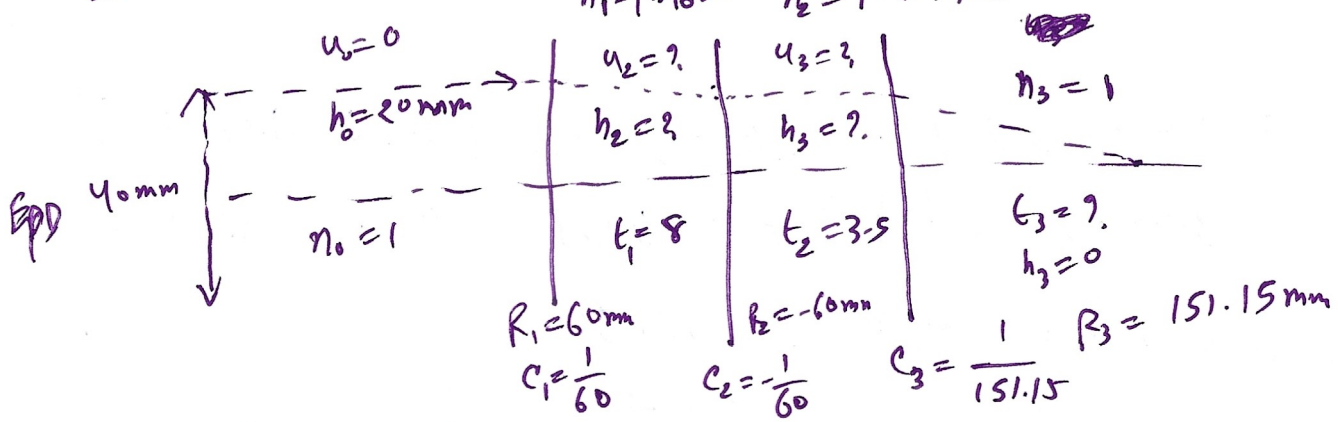
(d) Abbe number, $V = \dfrac{n_D - 1}{n_F - n_C} = \dfrac{1.6126 - 1}{0.010474}$

$= 58.49$

$V > 55$

$\therefore$ this is a crown glass

Prob 2 We draw the paraxial ray diagram below for marginal ray



From the paraxial ray trace eq^{n}s.

$$n_1 u_1 = n_0 u_0 - c_1 h_0 (n_1 - n_0)$$

$$\Rightarrow u_1 = \frac{n_0 u_0 - c_1 h_0 (n_1 - n_0)}{n_1}$$

putting the values. $\boxed{u_1 = -0.11357 \text{ rad}}$

$$h_1 = h_0 + u_1 t_1$$

$$\boxed{= 19.09142 mm}$$

$$u_2 = \frac{n_1 u_1 - c_2 h_1 (n_2 - n_1)}{n_2}$$

$$\boxed{= -0.07928 \text{ rad}}$$

$$h_2 = h_1 + u_2 t_2$$

$$\boxed{= 18.81396 mm}$$

$$u_3 = \frac{n_2 u_2 - c_3 h_2 (n_3 - n_2)}{n_3}$$

$$\boxed{= -0.04999938 \text{ rad}}$$

$$h_3 = h_2 + u_3 t_3 = 0$$

$$\Rightarrow \boxed{t_3 = -\frac{h_2}{u_3} = 376.284 mm}$$