

Homework-2
EEES 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 $\lambda = 587.5618 \text{ nm}$
 $= 0.5875618 \mu\text{m}$

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

$$F = 486.1327 \text{ nm} \\ C = 656.2725 \text{ nm}$$

(b) Dispersion across F-C band $= n_F - n_C$
 $= 1.619979 - 1.609505$
 $\boxed{= 0.010474}$

(c) Partial dispersion relative to D-C'

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

$C' = 643.8467 \text{ nm}$
 $D = 587.2738 \text{ nm}$

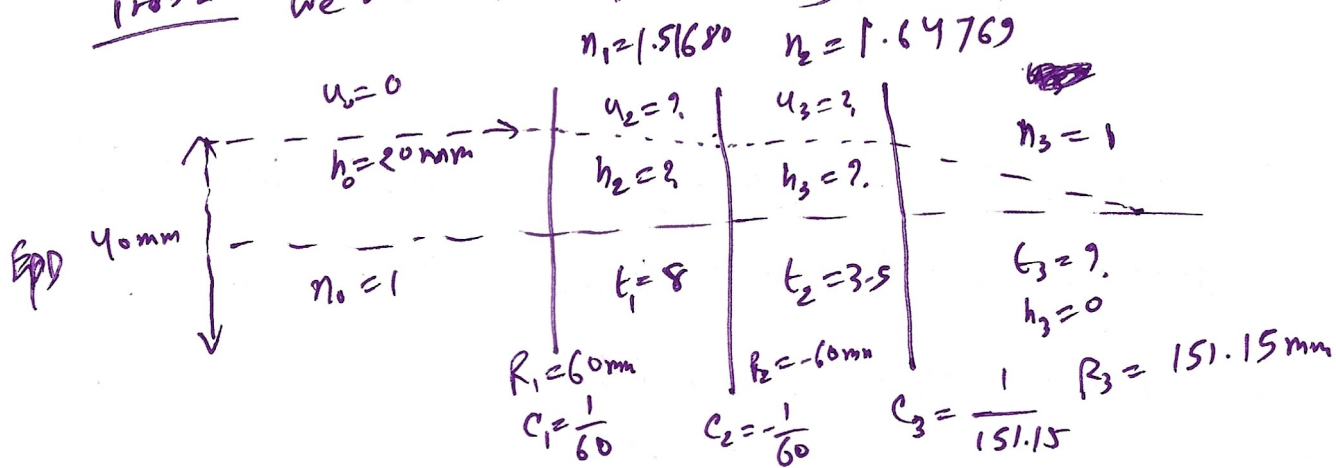
$$\boxed{= 0.246993}$$

(d) Abbe number, $V = \frac{n_D - 1}{n_F - n_C} = \frac{1.6126 - 1}{0.010474}$
 $= 58.49$

$$V > 55$$

\therefore this is a crown glass

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



From the paraxial ray-trace eq'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, $u_1 = -0.11357 \text{ rad.}$

$$h_1 = h_0 + u_1 t_1$$

$$= 19.09142 \text{ mm}$$

$$u_2 = \frac{n_1 u_1 - C_2 h_1 (n_2 - n_1)}{n_2}$$

$$= -0.07728 \text{ rad.}$$

$$h_2 = h_1 + u_2 t_2$$

$$= 18.81396 \text{ mm}$$

$$u_3 = \frac{n_2 u_2 - C_3 h_2 (n_3 - n_2)}{n_3}$$

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

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

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