Physics 303
Spring Quarter 1994
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George Williams

ave: 14

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THIRD MIDTERM

Name (print) Solution Name (signed) _____

Discussion Instructor (circle): Basko Chakhbazian DiCarlo Romer Wei Zhukov

Discussion Section # _____

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

A thin film of oil (n = 1.30) is sandwiched between two thick glass plates (n = 1.55). If constructive interference is observed in *transmission* with light at perpendicular incidence at the following wavelengths (not necessarily consecutive), calculate the thickness of the film.

λ_1 = 550 nm
λ_2 = 770 nm
λ_3 = 427 nm
λ_4 = 350 nm

Because of constructive interference in transmission, there is condition below:

$m \lambda / n = 2d$. $m\lambda = 2dn$, where m is an integer.

So. $m_1 \lambda_1 = m_2 \lambda_2 \Rightarrow \frac{m_1}{m_2} = \frac{\lambda_2}{\lambda_1} = \frac{7}{5}$

try $m_1 = 7$, $m_2 = 5$, I get

$m_2 \lambda_2 = m_3 \lambda_3 \Rightarrow m_3 = \frac{m_2 \lambda_2}{\lambda_3} = 9$

and $m_4 = \frac{m_2 \lambda_2}{\lambda_4} = 11$

conclusion $d = \frac{m_1 \lambda_1}{2n} = \frac{7 \times 550 \times 10^{-9}}{2 \times 1.3} = 1.48 \times 10^{-6}$ m