UNIVERSITY OF TORONTO
Faculty of Arts and Science
DECEMBER 2011 EXAMINATION
PHY385H1F
Duration – 2 hours

Instructions:
Please complete the following problems in the examination booklet(s) provided. Completely fill out your identifying information on each booklet you use, and number your booklets. On each page clearly indicate at the top which question you are answering or continuing. Show all your work. You will be graded on the correctness of your method and answer. If you use an equation from the Hecht text, please give the equation number and page number. If there is a final answer to any part, please draw a box around it.

Aids allowed:
- A pocket calculator with no communication ability.
- The full text of *Optics* 4th Edition (Copyright 2002) by Eugene Hecht.
- Up to two pages, each double-sided, of hand-written notes.

Possibly helpful information:

Speed of light in a vacuum: $c = 3.00 \times 10^{8}$ m/s
Planck's constant: $h = 6.63 \times 10^{-34}$ J s
Boltzmann's constant: $k = 1.38 \times 10^{-23}$ J/K
Permittivity constant: $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m
Permeability constant: $\mu_0 = 1.26 \times 10^{-6}$ H/m
1 electron-Volt = 1 eV = 1.60×10^{-19} J
Index of refraction of air: $n_{air} = 1.00$
Index of refraction of water: $n_{water} = 1.33$
Stefan-Boltzmann constant: $\sigma = 5.67 \times 10^{-8}$ W/m^2 K^4
Conversion from temperature T_C in °C to T_K in K is: $T_K = T_C + 273$

Note that there are 8 problems, but they are not all weighted equally. Here is the mark breakdown:

1. 18 points
2. 12 points
3. 15 points
4. 18 points
5. 5 points
6. 12 points
7. 12 points
8. 8 points

Total: 100 points