EE486 Integrated Circuit Fabrication Spring 2017

Homework 7 Due on <u>Friday</u>, June 2, 2017

1. What are two reasons why the damascene process (single damascene version) might be used instead of the normal masked plasma etch process?

2. Calculate and plot versus exposure wavelength the theoretical resolution (R) and depth of focus (DOF) for a projection exposure system with a numerical aperture (NA) of 0.85. Assume $k_1 = 0.5$ and $k_2 = 0.6$ (both typical values). Consider wavelengths between 10 nm and 1000 nm (EUV to visible light). The relevant equations are simply

$$R = k_1 \frac{\lambda}{NA}$$
 and DOF $= k_2 \frac{\lambda}{(NA)^2}$

Repeat for immersion in liquid with refractive index of 1.6 (use same plot).

Note that enhancement methods such as double patterning and high contrast resists make it possible to fabricate smaller structures (at least for DUV and visible) than the simple theory would suggest.