



Student ID:

Name:

Instructions: You have 1.5 hours to complete the test. Please write everything with blue or black ink pen so that all your work can be read easily. You can use your calculator. If you don't have a calculator, you can leave the formulas in expression forms and still get full score for the questions/exercises. Use of course notes or internet resources will invalidate the results of the test. Use of your cell phone is allowed only for scanning test and emailing the file at the end of the exam.

VERY IMPORTANT: Please WRITE YOUR FULL NAME AND STUDENT ID on the first sheet you scan. If you forget to include your name, I will not be able to put your material on record and therefore the test will NOT BE VALID!

Questions:

1. Verify that a circular polarizer whose Jones Matrix is $\frac{1}{2} \begin{bmatrix} 1 & j \\ -j & 1 \end{bmatrix}$ is completely transparent to one type of circularly polarized light and blocks completely the opposite circular polarization.
2. Calculate the penetration depth (i.e. the length at which the field amplitude reduces by a factor $1/e$) of a gold-air surface plasmon polariton at $\lambda=1064\text{nm}$ in the direction perpendicular to the propagation direction. Assume the dielectric constant of gold at $\lambda=1064\text{nm}$ is $\epsilon_g=-43.8-j0.8$ whereas the permittivity of air is $\epsilon_a=1$. If the interface is patterned with shallow perturbation, what is the periodicity required to excite the gold-air surface plasmon at normal incidence with the first diffraction order of the grating?
3. What are the main steps of a nanofabrication process? Briefly describe one technique of your choice for each step.