

To all students taking Optical Engineering (OE) oral exam:

This is a compendium of several “strange” questions I was able to recollect from other people (and myself included) in the OE exam. I call them “strange” or “weird” out of the fact that in order to be able to answer these questions, sometimes more than the knowledge taken from the lectures themselves and it’s more of “general knowledge” or being prepared beforehand for the questions themselves. Sometimes it is not even possible due to the exam itself being more about luck than knowledge (in my honest, subjective, point of view). Nonetheless, be aware of the following “foot notes” I have developed (along with my peers) regarding the OE exam.

1. NEVER arrange an exam which is potentially time-limited. If possible, try to have the exam when there is enough time between you and the next examinee or do it outside of the regular period where most people tend to make exams. This because when things are not going well in the exam, Prof. Stork will most likely cut off the exam once insufficient knowledge is perceived (with no change to continue) and give a mark in the range of 3.0 to 4.0.
2. When Prof. Stork says “study your subject well”, he means it. DO NOT WANDER OFF STUDYING EVERYTHING ELSE IF YOU WANT TO SECURE AT LEAST A 2.0 IN YOUR FINAL MARK. The path from 2.0 to 1.0 is entirely determined by good luck (i.e. that you studied beforehand the subject to be reviewed during your examination) and is highly likely to be able to determine what subject it will be, ranging from other optical devices, to fourier optics, lasers, or other optical engineering-related subjects. My suggested path to studying your optical device/system is:
  - a. Study the content from the lecture slides which contain your device. Remember that most devices are re-visited after optical aberrations (especially the human eye).
  - b. Study the basics first (how it works, basic concepts, basic operation). Then proceed with more advanced topics but PRIORITIZE basics.
  - c. Continue with the exercises given in the tutorials. While most tutorials are uploaded to ilias sometimes it is good to attend the tutorial itself for questions about your topic. It can be difficult to do so when not all systems have been reviewed yet but at least give it a try.
  - d. Continue with off-topic related subjects to your system found on the internet and on books. Try to remember only the basics but also remember to go far deep into what happens when a certain variable in the system is changed. This can save your mark from being in the range of 2.0.
  - e. Continue with the rest of the subjects.
3. As always, group discussion is encouraged for oral exams but it can prove difficult if your peers select different topics. In my honest opinion, the best strategy is that all of your peers pick a single optical system/device and each studies a part of it and then discuss. If possible, arrange the exams on the same date (to avoid variability in questions and provide more info as peers go into the exam).
4. The exam should be appointed with Prof. Stork secretary on the IPQ/ITIV building, 3<sup>rd</sup> floor. Don’t waste your time sending e-mails to Prof. Stork or the tutors. They will point to the secretary. She speaks English. She is a nice person.
5. Try to do the exam within the frame of the first exam period. Second semester is very packed of subjects, homework, laboratories (if you did not do them in the first semester), and activities all

over the place. If you wait too long you will have your mind busy with other things and memory can be deceiving.

6. Stick to a single optical system/device. Trust me. I switched mine out of fear I would not know everything but ended up being a very, very bad decision as I was not familiar with the device I picked at the end.

With all of that, I studied the telescope. Here is my protocol.

1. What is amplified by a telescope? (this took me a lot of time)
2. What are the basic telescope types that exist?
3. What is the principle of operation of each?
4. What is the name of each of the lenses in the telescopes?
5. Draw a ray diagram of the Keplerian telescope.

#### Answers

1. The angle of acceptance (angular magnification) of the remote object. Remember, it does not amplify the light, the length, the incident rays or anything crazy like that. Just say the angle. This is reviewed in the tutorials.
2. Keplerian and Galilean.
3. Keplerian consists of two convex lenses. Galilean consists of a concave lens and a convex lens.
4. Objective lens and eyepiece (or ocular)
5. Another weird mistake of mine. Remember that the Keplerian telescope has the focal point OUTSIDE of the ocular because it requires the rays from the objective to start DIVERGING so it can output straight rays back into the eye (visible at infinity to the eye) and amplifying the angle of acceptance in the process. Galilean has the focal point of the objective BEFORE (INSIDE) the ocular so it "catches" converging rays and then the concave lens outputs the plane rays to the eye.
  - a. The key is to remember "HOW DO YOU GET PLANE RAYS OUT OF THE OCULAR IF THERE IS A DIVERGING ELEMENT AT THE BEGINNING OF THE SYSTEM?"

This was the end of my test, unfortunately. Best of luck!