Examination in Optical Physics 021018

1-2

A telescopic sight is in principle a telescope whith two intermediate images.
One sight can be made as:
Z=0   Objective with f=120mm and diameter 40mm
Z=120mm   Field lens with f= 30mm and diameter 20mm
Z=150mm   Imaging lens with f=20mm and diameter 15mm
Z=240mm   Imaging lens with f=30mm and diameter 30mm
What will be the angular magnification
Where is the exit pupil?

3

The image of a green LED is top imaged into the line of sight (in the abovementioned instrument), using a glass plate at 45° to the symmetry axis.
It has a thin layer of a material with n=1,80.
Determine the thickness of the layer if high R is desired for green light and low R for blue and red.

4

A fourier optic setup is used to inspect a thred of yarn passing by.
Light distribution in the fourier plane is registered.
What happends if the thred:
a/ is moved to the side?
b/ has a knot?
c/ has a weak part, e g has a thinner section+
The answer should contain some reasoning and four sketches. One for the case when everything is OK, and one for each of the abovementioned cases.

5

A yellow sensation in the eye is created either by yellow light (around 565nm) or by a mix of green and orange red light.
Blue light (around 460) should not be present (or the result would be white)
Assume a crystal whose birefringence can be electrically controlled placed between crossed polarizers. What should be the phase difference between ordinary and extraordinary yellow light to give a yellow impression?

6

A laser has three longitudinal modes with the middle one having 50% of the power and the two remaining splitting the rest.
Plot the visibility in an interference pattern created by a Michelson interferometer as function of $\Delta L/L_{las}$.