Examination in Optical physics 120113

All examination aids except those which provide contact with the outer world are allowed. Draw figures whenever possible!

1-2

A macroscope is a term sometimes used to describe an instrument used to inspect objects at intermediate distances, say for example 500 mm from first lens. One such instrument is specified in the table below where z is a coordinate counted from $z= 0$ at first lens

$z = 0$	$f_1 = 50$ mm	$D_1 = 30$ mm
$z = 45,5$ mm	$f_2 = -20$ mm	$D_2 = 15$ mm
$z = 65,5$ mm	$f_3 = 20$ mm	$D_3 = 15$ mm
$z = 85,5$ mm	$f_4 = 20$ mm	$D_4 = 15$ mm

Calculate:

a/ angular magnification seen from eye placed in exit pupil of instrument (count from position of exit pupil both with and without instrument)

b/ field of view and also state if vinjetting exists

3

Polarizers based on absorption for far infrared (such as $\lambda=10,6$ µm) are not available. On can get reasonable separation of the directions of polarisation with a plate of germanium (n = 4,01) placed in Brewster angle. What will be the ratio TE/TM for the transmitted beam and for the reflected beam. Multiple reflections can be disregarded

4

What will be the modulation in the interference pattern of a Sagnac interferometer if beam splitter has a reflectance R (not equal to 0,50) ? Plot as function of R. Coherence can be assumed to be perfect

5

What is the diffraction pattern in Fraunhofer approximation of two circular apertures with diameter D separated (cc – distance) $4D$? Answer with calculations and a plot of the intensity along a line in diffraction pattern parallel with the line between the centers of the circles.

6

A $\lambda/2$ plate is rotated 360° between crossed polarisers. Plot the transmitted fraction of initially unpolarized light as function of angle. Axes must be graded.

Write your mail address on the envelope!!!