Examination in Optical physics 121019

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

1-2

The hyperfocal distance is defined as the object distance at which an instrument (normally a camera) is focused if the depth of focus should include infinity and reach as close to the instrument as possible. Derive an expression for the hyperfocal distance expressed in focal length, f-number and maximum blur circle diameter.

3

In some birefringent materials there are incident angles for which one polarisation has total internal reflection and the other polarization has brewster angle. Express the condition for this as birefringence ($\Delta n = n_{eo} - n_o$) as function of n_o

4

At what distance does a sodium street light (assume circular source with diameter 50 mm) become so transversally coherent as to produce an interference patters in a double slit with slit distance 1 mm (cc)?

5

What is the diffraction pattern in Fraunhofer approximation of two square apertures with sides a, separated (cc – distance) 3*a*? Answer with calculations and a plot of the intensity along a line in diffraction pattern parallel with the line between the centers of the squares.

6

What is the highest reflectance that can be achieved from a layer of TiO_2 (n= 2,40) on glass? Calculate first with just interference between the two first reflections and then with the entire series of reflections

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