KFUPM
Department of Physics
Phys412

Homework # 9

Due on Saturday, May 19, 2007

Problem 1

Using iteration approach, find the incident angle ,θ_i, in the anamorphic prism pair configuration shown in Fig. 6.12b for total beam magnification of 5. Assume that the index of refraction to be 1.500.

Problem 2

Ar^+ laser λ_p = 514 nm is used to pump Ti:Al_2O_3 laser rod from one side longitudinally. Assume the effective stimulated cross section of 3×10^{-19} cm^2, a round trip loss in the laser cavity of 6%, a life time of upper laser level of 3 μs, and pump efficiency of 30%. Find the laser spot size in the active rod for a threshold pump power of 1 W. Assume optimum pumping condition for which the spot size of the pumping laser is equal to the spot size of pumped laser in the active medium.

Problem 3

A Nd:YAG laser rod of 2 mm in diameter is pumped transversely at 808 nm wavelength by optical fibers coupled to diode lasers. Suppose that 80% of the optical power emitted from the fibers is absorbed in the rod, the mode spot size is 0.7 of the rod radius, a loss of single pass is 5 %, effective stimulated emission cross section is 3×10^{-19} cm^2, and the upper laser life time is 230 μs. What should be the power of the light emitted from the fibers for the laser to reach threshold?

Problem 4

A He-Ne laser with a tube of 4 mm in diameter, 30 cm in length, is found to operate optimally with a pressure of 5 torr and operating voltage of 780 V. What is the optimal pressure and operating voltage of the laser, if its tube diameter is reduced to 2 mm and its length to 10 cm?

Problem 5

Problem 6.13 from your textbook.