

Department of Physics
Mid-semester Examination
Optics & Lasers (PH 201)

Full Marks: 10

Date: 30.05.2020

ASSIGNMENT

1. Determine the single pass gain of a 0.1 m long Nd:YAG laser rod operating at 1.06 μm at room temperature. Assume the following:
 - (a) $A_{ul} = 4 \times 10^3 \text{ s}^{-1}$, no significant collisional or phonon broadening occurs on that transition, and there exist no radiative decay routes from level u other than to level l ;
 - (b) the pumping level i decays primarily to the upper laser level u , and the lower laser level l decays to the ground state 0, at a rate of 10^{12} s^{-1} ;
 - (c) the lower laser level i is 0.27 eV above the ground state;
 - (d) the pumping rate to the intermediate level i is 100 times the minimum value; and
 - (e) the doping concentration of the Nd:YAG rod is 10^{26} m^{-3} . [5]
2. Explain the operation of a laser with diagram showing essential components. Also show the corresponding energy level diagram. Mention the lasing wavelengths. [5]
