



# THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)  
Re-accredited (2<sup>nd</sup> Cycle) by NAAC with Grade “A”, CGPA – 3.46 on a 4-point scale

## Backlog Arrear Examination, March 2021

Course code: PGP 5521  
Course Title: Laser and Spectroscopy

Time: 3 Hrs  
Max. Marks: 75

Answer any FIVE Questions

5 x 15 = 75

1. Explain the light amplification of the Laser system, and derive the intensity of radiation of the output laser beam.
2. Describe the variation of laser power around threshold and derive the number of photon in the cavity under steady state conditions.
3. Derive quality factor and ultimate line width of the laser.
4. Discuss the energy levels, selection rules and spectral lines of a diatomic vibrating rotator in detail with neat diagrams.
5. Discuss the classical and quantum theory of Raman scattering.
6. Discuss the total Hamiltonian of the system and obtain the Hamiltonian for hyperfine structure of ESR absorptions.
7. Discuss the principle of Mossbauer spectroscopy and explain the recoilless emission and absorption of the gamma radiation.

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