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PHH 551

IV Semester M.Sc. Degree Examination, September/October 2022
(CBCS)
PHYSICS

Laser Physics, Vacuum Techniques and Cryogenics

Time : 3 Hours

Max. Marks : 70

Note : Answer **any four full** questions, choosing **one each** from
Part – I to IV and **two** questions from Part – V.

PART – I

1. a) Explain the terms directionality, monochromaticity and coherence of a laser beam.
b) Discuss the semi-classical theory of Einstein's two-level system and explain the meaning stimulated absorption, stimulated emission and spontaneous emission. **(5+10)**
2. a) Sketch a neat diagram and explain the working of He-Ne laser system.
b) What is a semiconductor laser ? Explain the conditions required to produce highly monochromatic laser beam. **(7+8)**

PART – II

3. a) Explain the basic principle of holograph. Compare the holography with ordinary photography.
b) What is harmonic generation of light ? Explain the various harmonic generations. **(6+9)**
4. a) With the help of a neat diagram discuss the Z-scan technique. How it measures intensity dependent non-linear susceptibilities of higher order harmonics ?
b) Explain the meaning of two-photon photoelectric effect. **(10+5)**

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PART – III

5. a) Explain the range of vacuum that can be produced in the laboratory.
b) What is freeze drying process ? Mention some of its important industrial applications. Also give some of its disadvantages. (6+9)
6. a) Compare the differences between Pirani gauge and Penning gauge.
b) With schematic diagram, explain in detail the construction and working of a diffusion pump. (5+10)

PART – IV

7. a) What is cryogenics ? Give its history.
b) Explain the working of Sterling's cycle gas liquefaction. Mention few important properties of liquid Helium. (6+9)
8. a) What is magnetic thermometer ? Explain its working.
b) What is evaporative cooling ? Explain neatly the working of adiabatic demagnetization cooling. (5+10)

PART – V

9. Answer **any two** questions. (5×2=10)
- a) Explain the Q-switching process in laser.
b) Give a brief account of any one electro-optic effect.
c) Explain the working of turbo-molecular pump.
d) Write a note on super conducting magnets and mention its advantages.
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