

B.Sc. Semester - 6 (CBCS) Examination
July-2025 (OLD COURSE)
SPECTROSCOPY AND APPLIED OPTICS(CORE)

Time: 2:30 Hours**Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

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- Que.1 (A) Answer any one question: (07)
1. Write a note on quantum numbers and their physical interpretation.
 2. Explain in brief: classical interpretation of normal Zeeman effect.
- Que.1 (B) Attempt any one: (04)
1. Explain Paschen-Back effect.
 2. Explain the space quantization.
- Que.1 (C) Attempt any three: (03)
1. A free atom is normally in its _____ state.
 2. Wein's displacement law is, $\lambda_m T =$ _____
 3. The effect of magnetic field on spectrum was discovered by _____.
 4. The band spectra are produced when emitting substance is in the _____ state.
 5. The anomalous Zeeman effect occurs in _____ magnetic field.
- Que.2 (A) Answer any one question: (07)
1. Explain classical theory of Raman effect.
 2. Write a short note on rotational-vibrational spectra.
- Que.2 (B) Attempt any one: (04)
1. Explain the theory of Electronic band spectra.
 2. Explain observation of Raman spectra.
- Que.2 (C) Attempt any three: (03)
1. The intensity gradually decreases from _____ in molecular spectra.
 2. _____ is the most complex of molecular spectra.
 3. The _____ band spectra is the most complex type of molecular spectra.
 4. Raman spectrum consist anti-stokes line, when $\Delta\nu$ is _____.
 5. A close and regular arrangement of different groups of bands, forming a _____ system.
- Que.3 (A) Answer any one question: (07)
1. Explain construction and working of Nd-YAG laser.
 2. Explain population inversion and pumping process in Laser.
- Que.3 (B) Attempt any one: (04)
1. Write a short note on Ruby laser.
 2. Write the application of laser in industry.

- Que.3 (C) Attempt any three: (03)
1. Give full form of Laser.
 2. In Ruby laser _____ ions are active centre.
 3. For Einstein coefficients, $\frac{B_{21}}{B_{12}} = \underline{\hspace{2cm}}$
 4. In which process light amplification occur?
 5. _____ Laser used in CD players.
- Que.4 (A) Answer any one question: (07)
1. Write a note on continuous X-ray spectrum.
 2. Explain powder diffraction method for x-rays.
- Que.4 (B) Attempt any one: (04)
1. Explain production of X-rays.
 2. Find the wavelength of 2nd order X-rays by NaCl crystal at angle of 3.7°. The grating element of NaCl crystal is 2.81 Å.
- Que.4 (C) Attempt any three: (03)
1. X-rays cannot produce chemical effect on photographic plate. True/False
 2. X-rays cause _____ in many substances like barium, cadmium, zinc sulphide etc.
 3. The short wavelength limit of the spectrum of X-ray is independent of the element of the _____
 4. In Coolidge tube, a block of _____ metal is used as a target.
 5. Write equation for Bragg's law.
- Que.5 (A) Answer any one question: (07)
1. Explain acceptance angle in optical fibre.
 2. Explain fibre optics communication system with block diagram.
- Que.5 (B) Attempt any one: (04)
1. Explain modes of propagation in optical fibre.
 2. Write a short note on fibre optic communication.
- Que.5 (C) Attempt any three: (03)
1. _____ is used as a source of light in optical fibre
 2. An optical fibre consists of _____ concentric elements.
 3. Optical fibre works on the principle of _____.
 4. The relative difference in the refractive indices of core and cladding is known as _____ refractive index.
 5. The dimension of numerical aperture is _____.
