

B.Sc. Semester - 6 (CBCS) Examination

March/April -2019

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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| 1. (a) Answer any one question: | 07 |
| 1. Write a note on experimental study of Zeeman effect. | |
| 2. Explain Paschen-Back effect. | |
| (b) Attempt any one: | 04 |
| 1. Explain the space(special) quantization. | |
| 2. Write the shortcomings of Bohr's theory. | |
| (c) Attempt any three: | 03 |
| 1. A free atom is normally in its _____ state. | |
| 2. Band spectra is also known as _____ spectra. | |
| 3. Write the wavelength range of visible spectrum. | |
| 4. Relation between $\bar{\nu}$, $\bar{l}$ and $\bar{s}$ is _____. | |
| 5. In the spectrum of sodium D lines, the doublet separation is _____. | |
| 2. (a) Answer any one question: | 07 |
| 1. Explain the theory of pure rotational spectra. | |
| 2. Explain classical theory of Raman effect. | |
| (b) Attempt any one: | 04 |
| 1. Explain the theory of Electronic band spectra. | |
| 2. Give the comparison between Raman spectra and fluorescence spectra. | |
| (c) Attempt any three: | 03 |
| 1. Which type of molecular spectra is the most complex? | |
| 2. The kinetic energy of the rotating molecule $E_r =$ _____. | |
| 3. Raman lines are strongly polarised. True/False | |
| 4. Raman shift is given by $\Delta\nu =$ _____. | |
| 5. Raman spectrum consists anti stokes line when $\Delta\nu$ is _____. | |
| 3. (a) Answer any one question: | 07 |
| 1. Explain construction and working of Ruby laser. | |
| 2. Derive the Einstein relationship. | |
| (b) Attempt any one: | 04 |
| 1. Write a note on Laser induced fusion. | |
| 2. Explain the condition for stimulated emission to dominate spontaneous emission. | |
| (c) Attempt any three: | 03 |
| 1. In which process light amplification occur? | |
| 2. In Nd-YAG laser _____ ions are active centres. | |
| 3. _____ laser used in CD players, CD-ROM and Optical reading. | |
| 4. Ruby laser has a _____ level pumping scheme. | |
| 5. He-Ne laser is a _____ laser. | |

- 4. (a) Answer any one question: 07**
1. Obtain the expression for Bragg's law and write the important conclusions.
 2. With neat diagram, explain Bragg's spectrometer.
- (b) Attempt any one: 04**
1. Obtain the Brillion zone of simple cube lattice.
 2. Find the wavelength of 2nd order X-rays by NaCl crystal at an angle of 4.5°. The grating element of NaCl crystal is 2.81 Å.
- (c) Attempt any three: 03**
1. X-rays produce chemical effect on photographic plate. True/False
 2. The intensity _____ with increase in order of diffraction.
 3. X-rays are produced whenever high speed _____ are stopped abruptly by target of some material.
 4. X-rays are not capable of damaging living cells. True/False
 5. Write any one method of generating X-rays.
- 5. (a) Answer any one question: 07**
1. Derive an expression for acceptance angle of the optical fiber.
 2. Explain types of optical fiber.
- (b) Attempt any one: 04**
1. Derive an expression of NA.
 2. In an optical fiber, the core material has refractive index 1.43 and refractive index of cladding material is 1.40. Find the propagation angle.
- (c) Attempt any three: 03**
1. _____ is the measure of how much light can be collected by an optical system.
 2. Optical fiber works on the principle of _____.
 3. The intensity is proportional to the square of the amplitude. True/False
 4. Fractional refractive index change is always _____.
 5. A medium having higher refractive index is known as optically rarer medium. True/False
