

B.Sc. Semester - 6 (CBCS) Examination**April/May-2022 (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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- Q.1 (a) Answer any **one** question: 07
- (1) Explain classical interpretation of normal Zeeman effect.
 - (2) Explain Paschen-Back effect.
- (b) Attempt any **one**: 04
- (1) Explain the space quantization.
 - (2) Write a note on Stark effect.
- (c) Attempt any **three**: 03
- (1) A free atom is normally in its _____ state.
 - (2) In a _____ effect, the effect of electric field on spectral lines is studied.
 - (3) The anomalous Zeeman effect occurs in _____ magnetic field.
 - (4) _____ component is absent in parallel view of Zeeman effect.
 - (5) In the spectrum of sodium D lines, the doublet separation is _____.
- Q.2 (a) Answer any **one** question: 07
- (1) Explain the theory of rotational-vibrational spectra.
 - (2) Explain quantum theory of Raman effect.
- (b) Attempt any **one**: 04
- (1) Explain the theory of Electronic band spectra.
 - (2) Write the applications of Raman spectra.
- (c) Attempt any **three**: 03
- (1) _____ is the most complex of molecular spectra.
 - (2) A band has a sharp intense edge on one side is called _____.
 - (3) Raman lines are strongly polarised. True/False
 - (4) Line frequency is always _____ then the incident frequency for fluorescence spectra.
 - (5) Raman spectrum consists anti stokes line when $\Delta\nu$ is _____.
- Q.3 (a) Answer any **one** question: 07
- (1) Explain construction and working of Nd:YAG laser.
 - (2) Describe holography in detail.
- (b) Attempt any **one**: 04
- (1) Write the applications of laser in industry.
 - (2) Explain three level pumping scheme.
- (c) Attempt any **three**: 03
- (1) In which process light amplification occur?
 - (2) In Ruby laser _____ ions are active centres.
 - (3) Write full form of LASER.
 - (4) Laser light is said to be _____, which means that the wavelengths of the laser light are in-phase.
 - (5) Ruby laser is a _____ laser.

- Q.4 (a) Answer any **one** question: 07
- (1) Explain: Brillouin zones.
 - (2) Explain powder diffraction method for x-rays.
- (b) Attempt any **one**: 04
- (1) Write the properties of X-rays.
 - (2) Find the wavelength of 2nd order X-rays by NaCl crystal at an angle of 3.7° .
The grating element of NaCl crystal is $2.81 \text{ \AA}$.
- (c) Attempt any **three**: 03
- (1) X-rays can not 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 capable of damaging living cells. True/False
 - (5) In Coolidge tube, a block of _____ metal is used as a target.
- Q.5 (a) Answer any **one** question: 07
- (1) What is the acceptance angle for an optical fibre? Derive its expression.
 - (2) Explain fibre optics communication system with block diagram.
- (b) Attempt any **one**: 04
- (1) Write a note on medical applications of optical fibre.
 - (2) In an optical fibre, the core material has refractive index 1.546 and refractive index of cladding material is 1.378. Find the value of numerical aperture.
- (c) Attempt any **three**: 03
- (1) _____ is used as a source of light in optical fibre.
 - (2) Optical fibre works on the principle of _____.
 - (3) The intensity is proportional to the square of the amplitude. True/False
 - (4) The angle of incident for which the angle of refraction is 90° , is called _____.
 - (5) The innermost cylindrical region of optical fibre is known as _____
