

B.Sc. Semester - 6 (CBCS) Examination
March/April-2023 (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 the following question. (Any One) (07)

1. Write a note on quantum numbers and their physical interpretation.
2. Explain Paschen-Back effect.

Q.1(B) Answer the following question. (Any One) (04)

1. Explain experimental study of Zeeman Effect.
2. Explain the space quantization.

Q.1(C) Answer the following questions. (Any Three) (03)

1. A free atom is normally in its _____ state.
2. When the matter in bulk heated, it emits _____ spectra.
3. The effect of magnetic field on spectrum was discovered by _____.
4. _____ component is absent in parallel view of Zeeman effect.
5. The anomalous Zeeman effect occurs in _____ magnetic field.

Q.2(A) Answer the following question. (Any One) (07)

1. Explain classical theory of Raman effect.
2. Write a short note on rotational-vibrational spectra.

Q.2(B) Answer the following question. (Any One) (04)

1. Explain the theory of Electronic band spectra.
2. Explain observation of Raman spectra.

Q.2(C) Answer the following questions. (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 stokes line, when $\Delta\nu$ is _____.
5. Raman lines are strongly _____.

Q.3(A) Answer the following question. (Any One) (07)

1. Explain construction and working of Nd-YAG laser.
2. Explain population inversion and pumping process in Laser.

Q.3(B) Answer the following question. (Any One) (04)

1. Write a short note on Ruby laser.
2. Write the application of laser in industry.

- Q.3(C) Answer the following questions. (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.
- Q.4(A) Answer the following question. (Any One) (07)**
1. Write a note on continuous X-ray spectrum.
 2. Explain powder diffraction method for x-rays.
- Q.4(B) Answer the following question. (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.
- Q.4(C) Answer the following questions. (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.
- Q.5(A) Answer the following question. (Any One) (07)**
1. Describe types of optical fibres.
 2. Explain fibre optics communication system with block diagram.
- Q.5(B) Answer the following question. (Any One) (04)**
1. Explain modes of propagation in optical fibre.
 2. Write a note on medical application of optical fibre.
- Q.5(C) Answer the following questions. (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 _____.
