7505/MP4 **OCTOBER 2008**

Paper IV — OPTICS AND SPECTROSCOPY

(For those who joined in July 2003 and after)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

All questions carry equal marks.

1. (a) Discuss linear, circular and elliptical polarization.

Or

(b) Describe Fabry Perot interferometer and explain its working. Obtain an expression for the resolving power of a Fabry Perot interferometer.

2. (a) (i) Give the theory of optical resonators.

(ii) Write note on Kerr effect.

Or

(b) Explain Fraunhofer diffraction pattern of single slit for rectangular and circular apertures.

3. (a) (i) Give the quantum theory of Raman effect.

(ii) How rotational energy changes in molecules can be studied using Raman effect?

Or

(b) Discuss the vibrational spectra of a diatomic molecule with reference to harmonic and anharmonic oscillators.

4. (a) Give the theory of vibrational and rotational structure of electronic spectra.

Or

(b) Describe in detail the experimental arrangements for studying Raman spectra in liquids. Distinguish between Raman spectra and IR spectra.

5. (a) Give an account of electron spin resonance spectroscopy. Explain the hyperfine structure of ESR spectrum of an atom with a single unpaired electron.

Or

(b) Give the theory of Mossbauer effect. How it is studied experimentally? Discuss its applications.