Quantum Optics
Themes of the Complex exam

1. Quantization of a single mode field, number states, the photon concept
2. Quantization of the electromagnetic field in general, of the system charges+ E.M. field
3. Coherent states, definition and properties
4. Mixtures in quantum optics, density operator of the polarization state, thermal fields
5. Quasiprobability distributions in quantum optics, the notable distributions
6. Quantum optics of beam splitters, Hong-Ou Mandel experiment, quantum eraser
7. Quantum coherence functions, photon detection, photon bunching and antibunching
8. Squeezed states, definition, their generation and detection. Other, highly nonclassical states
9. Resonator quantum electrodynamics, Jaynes-Cummings-Paul model
10. Quantum optical experiments with Rydberg atoms in a cavity and with trapped ions
11. Elementary theory of spontaneous emission, Lamb shift and the Casimir effect
12. Multiatomic emission, superradiation

Literature:

C. Gerry, P. Knight: Introductory quantum optics, Cambridge University Press, 2005

R. Loudon: The quantum theory of light, 3rd ed. Oxford, 2000

M. Scully, S. Zubairy: Quantum Optics, Cambridge, 1997