

Lab

87-p3-upq-Con No. File

Con. 5628-10.

FE/Sem II/All Branches.

Applied Physics - II

3-12-10

GT-7818

(2 Hours)

[Total Marks : 75]

- N.B. : (1) Question No. 1 is compulsory.  
(2) Attempt any **four** out of remaining **six** questions.  
(3) Assume **suitable** data wherever **necessary**.  
(4) **Figures** to the **right** indicate **full** marks.

Q.No.1 Attempt any five : 5 x 3 = 15

- Differentiate between stimulated emission and spontaneous emission.
- Explain why thin film interference pattern for wedge film is parallel where as for Newton's ring it is circular?
- Explain De-Broglie's hypothesis.
- What particular spectra would be absent, when the width of the opacity is double than that of the transparency in a grating?
- Explain Pirani gauge.
- Differentiate between soft and hard magnetic materials.
- What is the wave length of a beam of neutron having whose energy is 0.025eV and mass  $1.676 \times 10^{-27}$ kg.

Q.No.2 9 + 6

- Describe the origin of color on thin film, with the derivation of constructive and Destructive condition.
- Light incident on a grating of 0.5 cm wide with 3000 lines. Find angular separation in 2<sup>nd</sup> order of two sodium lines  $5893 \text{ \AA}$  &  $5896 \text{ \AA}$ . Check whether those two lines are resolved in 2<sup>nd</sup> order or not?

Q.No.3 9 + 6

- Differentiate between step index fiber & graded index fiber. Derive the expression for N.A for both.
- A plane wave of monochromatic light falls normally on a uniform thin film of oil, which covers a glass plate. The wave length of the source can be varied continuously. Complete destructive interference is obtained only for wave lengths  $5000 \text{ \AA}$  &  $7000 \text{ \AA}$ . Find the thickness of the oil layer. Given that R.I. of oil = 1.3 & R.I. of glass = 1.5.

Q.No.4 9 + 6

- Explain Metastable state, Pumping, Population Inversion & Laser action. Describe how those are takes place in He-Ne laser.
- The position & momentum of 1 keV electron are simultaneously measured. If its position is located within 10 nm, then what is the percentage of uncertainty in its momentum?

Q.No.5 9 + 6

- By using Time Independent Schrödinger wave equation, prove that, the energy levels of a particle in one dimensional box are quantized, where as for free particle energy is continuous.
- Relative R.I. of a fiber is 0.055, when core R.I. is 1.48. Find N.A., cladding R.I., acceptance angle, normalized frequency (V) & the number of guided modes, when wave length of light propagated is  $1 \mu\text{m}$  and radius of the core is  $50 \mu\text{m}$ .

Q.No.6 9 + 6

- Discuss Weiss' Theory of Ferromagnetism and derive Curie-Weiss's Law,  $\chi = C/(T - \theta)$
- Consider an air core toroid with 500 turns, with a cross section of  $6 \text{ cm}^2$ , mean radius of 15 cm and coil current of 4 amp. Now calculate m.m.f ( $NI_0$ ), Reluctance (R), M-flux ( $\psi$ ), M-flux density (B), M-field intensity (H).

Q.No.7 Write short notes on any three : 3 x 5 = 15

- Rotary pump
- FM
- Properties of Nano materials
- Holography