

1/6/2011

F.E II (Rw) All Branches
Applied Physics - II
RK-1095

Con. 3087-11.

(2 Hours)

[Total Marks : 75

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions from question Nos. 2 to 7.
(3) Use suitable **data** wherever **necessary**.

1. Answer any **five** from the following :—

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- Why does the fringe width decrease as order increases in Newton's Rings but remain constant in a wedge shaped film ?
- What is Rayleigh's Criterion of resolution for diffraction ? Write the expression for Resolving Power of grating.
- Explain the role of Helium in the He-Ne Laser.
- Why are soft magnetic materials used in transformer Cores ?
- What are the functions of the Optical Resonator in a Laser ?
- Using Heisenberg's Uncertainty Principle, show that electrons cannot exist within the nucleus.
- How is the phenomenon of interference used to test for optical flatness ?

2. (a) Obtain the conditions for maxima and minima due to interference in a wedge-shaped film observed in reflected light. Derive the expression for fringe width. 8

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(b) State the two types of diffraction and differentiate between them. Reduce the missing orders for a double slit Fraunhofer diffraction pattern if the slit widths are 0.16mm and they are 0.8mm apart. 7

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3. (a) Explain phase velocity of a wave and group velocity of matter waves. Derive the one-dimensional time dependent Schrodinger wave equation for matter waves. 8

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(b) Explain the refractive-index profiles of step index and graded index fibres. An optical fibre has a Numerical Aperture of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water which has a refractive index of 1.33. 7

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4. (a) Explain how the wave length of a spectral line can be determined in the laboratory using a plane transmission grating. White light falls normally on a soap film of refractive index 1.33 and of thickness 5000 Au. What wavelength within the visible spectrum will be strongly reflected ? 8

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(b) With neat diagrams explain the construction and working of a Nd : YAG Laser. Discuss the pumping scheme. 7

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5. (a) What is the role of Laser in the field of communication ? Explain Numerical Aperture and derive the same for step index fibres. 8
- (b) Draw a graph to show the variation of magnetic induction 'B' with applied magnetic field 'H' in case of ferromagnetic materials. Calculate the members of ampere turns required to produce a flux of 10^{-3} weber round an iron ring of 5cm^2 cross section and 20mm mean diameter having an air gap 2mm wide across it. The relative permeability of iron is 1000. Neglect the leakage flux. 7
6. (a) Explain the atomic origin of ferromagnetism. Differentiate between diamagnetic and paramagnetic materials. 8
- (b) What is the physical significance of the wave function Ψ of a matter wave ? An electron is bound in a one-dimensional potential well of width 2Au , but of infinite height. Find its energy values in the ground state and first two excited states. 7
7. Write short notes on any **three** of the following :— 15
- (a) Rotary Pump
 - (b) SEM
 - (c) Penning gauge
 - (d) AFM
 - (e) Application of Vacuum Technology.