1E2003

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1E2003

B. Tech I Sem. (Main/Back) Exam. Jan-Feb 2013

103 Engineering Physics – I

Common to all Branches

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit**. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

UNIT – I

Q.1 (i) Explain the working of Michelson's interferometer. How will you produce circular fringes with it? How will you measure the difference in wavelength between the D lines of sodium light? [4+4+4]

(ii) Write a note on the interference filters. [4]

OR

Q.1 (i) Explain how Newton's rings are formed and describe the method for determination of wavelength of light using Newton's rings. [4+4]

(ii) Newton's ring avengement is used with a source emitting two wavelengths λ_1 and λ_2 . It is found that the n^{th} dark ring due to λ_1 concides with $(n+1)^{th}$ dark ring due to λ_2. Find the diameter of the n^{th} dark ring for wavelength λ_1 = 600nm if λ_2 = 590nm and radius of curvature of the lens is 0.9m [8]

UNIT-II

Q.2 (i) Explain what you mean by polarizations of light. Distinguish between polarised light and unpolarised light. [4+4]

(ii) Explain the phenomenon of double refraction in a calcite crystal. What happens when two such crystals are rotated relative to one another? [3+3]

(iii) Write a short note on the law of Malus. [2]

OR

Q.2 (i) What do you understand by a quarter-wave plate and a half–wave plate? If you are given a quarter-wave plate, a half-wave plate and a simple glass plate, how will you proceed to distinguish them from each other? [2+3]

(ii) Explain how a quarter – wave plate and a half – wave plate could be constructed. Describe their properties. [3+2]

(iii) A sugar solution in a glass tube of 20cm. length produces an optical rotation of 13^0. The solution is then diluted to one–third of its previous concentration. Estimate the optical rotation produced by a 30cm. long glass tube containing the diluted solution. [6]

UNIT-III

Q.3 (i) What do you mean by diffraction of light? What is the difference between interference and diffraction of light? [4+4]

(ii) Describe and explain the nature of fringes obtained with the help of a single slit placed in front of a parallel beam of monochromatic light. [4+4]

OR

Q.3 (i) Obtain an expression for the dispersive power of a grating. [4]

(ii) What are the differences between Grating and Prism spectra? [4]

(iii) For a given plane transmission grating having 5000 lines /cm. answer the following:

(a) For a wavelength of 600nm., what is the highest order of spectrum observed? [4]

(b) If opaque spaces are exactly twice the transparent spaces, which order of spectra will be absent? [4]

UNIT-IV

Q.4 (i) Explain what is 'ionic bonding'. Explain how the force of attraction between two atoms or ions vary as they are brought closer. [4+4]

(ii) (a) Define Fermi function and Fermi energy. [4]

(b) Explain with graph, the variation of Fermi function with temperature. [4]

OR

Q.4 (i) Describe the formation of energy band in solids and hence explain how it helps to classify the materials into conductors and insulators. [2+2]

(ii) In an intrinsic semiconductor show that the Fermi level lies in the middle of its forbidden gap. [4]

(iii) The energy gap of two intrinsic semiconductors A and B 0.36eV and 0.72eV respectively. Compare the intrinsic career density of A to B at 300K (Given $m_h = m_e = 9*10^{-31}$ Kg and $2kT = 0.052eV$) [8]

UNIT-V

Q.5 (i) What is 'length contraction' and 'time dilation' in relativistic mechanics? Explain. [4+4]

(ii) Describe experiment verification of time dilation. [8]

OR

Q.5 (i) Prove the relation $E^2 = p^2c^2+m_o^2c^4$, where p is momentum, m_o is the rest mass and c is speed of light. [8]

(ii) Calculate the velocity of a particle having kinetic energy three times the rest mass energy. [8]
