SVKM's NMIMS
MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Programme: B. Tech. (All Streams) Year: I Semester: I

Batch: 2014-15

Academic Year: 2016-2017

Subject: Engineering Physics

Date: 26 May 2017

Marks: 60
Time: 10.00 am to 1.00 pm
Durations: 3 (hrs)
No. of Pages: 2

Re-Examination

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

1) Question No. 1 is compulsory.
2) Out of remaining questions, attempt any 4 questions.
3) In all 5 questions to be attempted.
4) All questions carry equal marks.
5) Answer to each new question to be started on a fresh page.
6) Figures in brackets on the right hand side indicate full marks.
7) Assume Suitable data if necessary.

Que.1: **Attempt *any four* of the following.**

a) Explain various types of dislocations. [03]
b) Explain any two applications of CRO using diagrams. [03]
c) Enlist the thermal properties of the materials and explain any two in detail. [03]
d) Describe any three applications of superconductors. [03]
e) Write a short note on GRIN fiber. [03]
f) Monochromatic light emitted by a broad source of wavelength 5800Å, falls normally on two plates of glass enclosing a wedge shaped air film. The plates touch at one end and are separated at a point 15 cm from that end by a wire of 0.05 mm diameter. Find the fringe width. [03]
g) What is P-N junction? Discuss the formation of barrier potential. [03]

Que.2:
a) Explain the construction and working of the molecular gas laser. [06]
b) Explain the various types of Josephson effect in superconductors. [03]
c) The ultrasonic echo pulse method is used with defective and non-defective steel bars of thickness 50 cm. If pulse arrival times are 35 and 75 μs, respectively then locate the distance at which defect is present. [03]

Que.3:
a) Explain the fiber losses and dispersion effect in optical fiber. [06]
b) What do you mean by diffraction grating? Derive the expressions for dispersive power and resolving power of grating. [03]
c) For mercury of mass number 202 and transition temperature is 4.2 K. Find the transition temperature for the isotope of mercury of mass number 200. [03]

Que.4: **a)** Derive an expression for Fermi level in intrinsic semiconductor giving a neat diagram. **[06]**

b) Explain the following properties of materials: 1) Toughness, 2) Ductility and 3) Thermal shock resistance. **[03]**

c) A glass fiber have refractive index of core 1.5 and fractional index change 0.0005, determine- i) refractive index of cladding, ii) acceptance angle, iii) NA for the fiber. **[03]**

Que.5: **a)** Derive the following terms for FCC crystal structure- i) effective number of atoms per unit cell, ii) atomic radius, iii) Nearest neighbors distance iv) APF, v) Void space, vi) coordination number. **[06]**

b) Explain any three applications of laser. **[03]**

c) Determine the distance between two adjacent atoms in NaCl crystal (FCC). The density of NaCl crystal is 2180 Kg/m^3. The atomic weights of Na and Cl are 23 Kg/k mol and 35.5 Kg/k mol, respectively. **[03]**

Que.6: **a)** What are Newton's rings? Derive the expressions for diameters of dark and bright rings. **[06]**

b) A light beam incident normal to the plane of the grating having 4250 lines/cm and second order maxima is found at 30^0 with respect to direction of incidence. Find out the wavelength of the light beam. **[03]**

c) An electric field of 100 V/m is applied to a crystal of n-type semiconductor with Hall coefficient of -0.0125 m^3/C. Determine the current density through the crystal. (Given: μ_n=0.36 m^2/VS). **[03]**

Que.7: **a)** Derive an expression for e/m of an electron using crossed electric and magnetic fields in a cathode ray tube with neat diagram. **[06]**

b) An electron beam passes through a point where magnetic field of $2x10^{-3}$ Wb/m^2 and electric field of $3.4x10^4$ V/m both acting simultaneously and perpendicular to each other so that the path of electrons remains unchanged. Calculate the speed of electrons. If the electric field is switched off, what will be the radius of circular path? **[03]**

c) Explain the construction and working of a piezo-electric oscillator giving a neat diagram. **[03]**