

www.FirstRanker.com

www.FirstRanker.com



17PHY12

First Semester B.E. Degree Examination, Dec.2017/Jan.2018 **Engineering Physics**

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing one full question from each module. 2. Physical constants : Velocity of light, $c = 3 \times 10^{-8}$ rn/s Planck's constant, $h = 6.63x \ 10^{-34} JS$ Mass of electron, $m_e = 9.1 \times 10^{31}$ kg Charge of electron, $e = I.6x \ 10^{49}O$ Boltzmann constant = $1.38 \times 10^{-23} JIC^{I}$

Module-1

Avogadro number = 6.02×10^{23} /moi

- a. Write the assumptions of Planck's law of radiation. Deduce Wein's law and Rayleigh-Jeans 1 law from Planck's law of radiation. (07 Marks) (06 Marks)
 - Set up time independent one dimensional Schrodinger wave ^{*} uation. b.
 - What is Compton effect? Explain its physical significance.t C.
 - An electron is bound in an one dimensional potential well of width 1 A, but if infinite wall d. height. Find its energy values in the ground state, and also in the first excited states.

(04 Marks)

(03 Marks)

(03 Marks)

OR

- State Heisenberg's uncertainty principle. Show t!-at electrons cannot exist inside the nucleus. a. (07 Marks) b.
 - State de Broglie hypothesis and show that group velocity is equal to particle velo city. (06 Marks)
- Briefly explain three properties of wave function. c.
- Compute the de Broglie wavelength for an electron moving with one tenth part of the d. velocity of light. (04 Marks)

Module_2

- a. Explain Fermi energy and Fermi factor. Explain the variation of Fermi factor with 3 temperature. (07 Marks)
 - Derive the expression for electrical conductivity of an intrinsic semiconductor. (05 Marks) b.
 - Write a note on Meglave vehicles. с.
 - The electron concentration in a semiconductor is 5 x 10^{11} m⁻³. Calculate the conductivity of d. the material if the drift velocity of electron is 350 ms⁻¹ in an electric field of 1000 Vm⁻¹.

(04 Marks)

(04 Marks)

OR

Discuss the merits of quantum electron theory. (06 Marks) 4 a. What is superconductivity? Explain Type-I and Type-11 superconductors. (06 Marks) b. What is (i) mean collision time, (ii) drift velocity, (iii) Meissner effect? C. (04 Marks) given that its Fermi energy is 5.5 eV and the relaxation time for electrons is 3.83×0.14 S. d.

(04 Marks)

1 of 2

www.FirstRanker.com

CO 0 C' 2



17PHY12

Module-3

- Define angle of acceptance and numerical aperture. Obtain an expression for the numerical 5 a. aperture of an optical fiber. (07 Marks)
 - b. What is holography? Explain the principle of construction of hologram with suitable ray diagram. (05 Marks)
 - c. Explain the processes of spontaneous emission and stimulated emission. (04 Marks)
 - d. A medium in thermal equilibrium at temperature 300 K has two energy levels with a Find the ratio of population densities of the upper and lower wavelength separation of 1 levels. (04 Marks)

OR

- 6 a. Describe the construction of CO, laser and explain its working with the help of energy level diagram. (06 Marks) (06 Marks)
 - b. discuss the three types of optical fibers with suitable diagrams.
 - c. Mention four applications of LASER.
 - d. The angle of acceptance of an optical fiber is 30° when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. (04 Marks)

Module₋4

7 a. Explain in brief the seven crystal systems with neat diagrams.

- b. Explain the crystal structure of diamond with neat sketch and calculate its atomic packing factor. (06 Marks)
- c. Define unit cell, primitive cell and Bravias lattice. (03 Marks)
- d. Calculate the glancing angle for incidence of x-rays of wavelength 0.58 A on the plane (132) of NaC, E which results in second order diffraction maxima taking the lattice constant as

3.81A.

(04 Marks)

(04 Marks)

(07 Marks)

OR

- a. What are Miller indices? Derive an expression for interplanar distance interms of Miller 8 indices. (07 Marks)
 - b. Define coordination number and packing factor. Calculate the packing factor for SCC and FCC structure. (06 Marks)
 - c. Derive Bragg's law. (04 Marks)
 - d. Draw the following planes in a cubic unit cell: i) (111) iii) (0 1 1). ii) (101)(03 Marks)

Module-5

9 a. Describe the construction and working of Reddy's shock tube. (06 Marks)

- b. Discuss the variation of density of energy states for 3D, 2D, 1D and OD structures. (06 Marks)
- c. Describe soi gel method of producing nano particles. (05 Marks)
- d. Mention any three applications of nano particles. (03 Marks)

OR

a. Describe the principle, construction and working of a scanning electron microscope. 10

(08 Marks)

- b. Define: 1) Mach number ii) Subsonic waves iii) Supersonic waves iv) Ultrasonic waves. (04 Marks)
- Explain pyrolysis method of obtaining carbon nanotubes. c.
- (04 Marks) d. The distance between the two pressure sensors in a shock tube is 100 mm. The time taken by a shock wave to travel this distance is 100 microsecond. If the velocity of sound under the same conditions is 340 ms⁻¹, find the Mach number of the shock wave. (04 Marks)

www.FirstRanker.com