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14PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2019
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: $h = 6.625 \times 10^{-34}$ JS, $C = 3 \times 10^{8}$ m/s, $m = 9.1 \times 10^{-31}$ kg, $K = 1.38 \times 10^{-23}$ J/K, $\epsilon_0 = 8.854 \times 10^{-12}$ F/m

Module – 1

1 a. State Wein's law and Reyleigh – Jean's law and mention their draw backs. **(06 Marks)**

b. State Heisenberg's uncertainty principle and show that electron does not exist inside the nuclear by this principle. **(05 Marks)**

c. Define phase velocity and Group velocity. Obtain the relation between group velocity and phase velocity. **(05 Marks)**

d. The particle of mass 0.65 Mev/c^2 has a kinetic energy of 100ev. Find the de-Broglie wavelength. **(04 Marks)**

2 a. Explain Compton effect and mention its physical significance. **(04 Marks)**

b. Using time independent Schrödinger's wave equation find the Eigen values and Eigen functions for an electron in one dimensional potential well of infinite height. **(07 Marks)**

c. What are matter waves and explain any three characteristics of matter waves? **(05 Marks)**

d. The position and momentum of 1 Kev electrons are simultaneously determined. Its position is located within 1A°. What is the percentage of uncertainity in its momentum? **(04 Marks)**

Module – 2

3 a. Explain in brief the failure of classical free electron theory. **(06 Marks)**

b. Derive an expression for electrical conductivity of Intrinsic Semi conductor. **(06 Marks)**

c. Explain in brief the working of Maglev vehicle. **(04 Marks)**

d. Calculate the probability of an electron occupying an energy level 0.02ev above the Fermi level at 200k and 400k in a material. **(04 Marks)**

4 a. Define the terms : i) Drift velocity ii) Mean free path
iii) Fermi energy iv) Meissner effect. **(04 Marks)**

b. What is Hall effect? Obtain an expression for charge density interms of Hall voltage. **(06 Marks)**

c. Explain Type I and Type II super conductors. **(06 Marks)**

d. The electron mobility and hole mobility of silicon are 0.17m^2/volt – sec and 0.035m^2/v.sec respectively at room temperature. If the carrier density is known to be 1.1×10^{16} m^3. Calculate the resistivity of silicon semi conductor material. **(04 Marks)**

Module – 3

5 a. Obtain an expression for energy density interms of Einstein's coefficients A and B. **(06 Marks)**

b. Define the terms : i) Simulated emission ii) Population inversion
iii) Numerical aperture iv) Attenuation. **(04 Marks)**

c. Explain the construction of an holographic image and mention its applications. **(06 Marks)**

d. An optical fiber has a core and cladding materials of refractive indices 1.55 and 1.50 respectively. The light is launched into it in air. Calculate the Numerical aperture, the acceptance angle and fractional index change. **(04 Marks)**

6 a. Describe the construction and working of semiconductor laser. **(07 Marks)**

b. Mention different types of optical fibers. With a neat diagram explain the mode of propagation of light through fibers. **(09 Marks)**

c. Calculate the ratio of Einstein coefficients for a system in thermal equilibrium of 300k in which radiation of wavelength 1.39 μm is emitted. **(04 Marks)**

Module – 4

7 a. Explain in brief the Seven Crystal System. **(07 Marks)**

b. Calculate the atomic packing fraction of B.C.C and F.C.C lattices. **(04 Marks)**

c. Explain with suitable diagrams how a Liquid Crystal Display works. **(06 Marks)**

d. Evaluate the Miller indices of plane with intercepts a, $\frac{b}{2}$, 3c in a simple cubic unit cell. **(03 Marks)**

8 a. Derive the expression for interplaner spacing interms of Miller indices. **(06 Marks)**

b. Define the terms : i) co-ordination number ii) Allotropy iii) Polymorphism. **(03 Marks)**

c. Describe the construction and working of Bragg's x-ray diffractometer and how crystal structure can be indentified using this. **(07 Marks)**

d. Discuss the crystal structure of diamond. **(04 Marks)**

Module – 5

9 a. What is Mach number? Distinguish between subsonic and supersonic waves. **(05 Marks)**

b. What is a shock wave and mention any four applications of shock waves? **(05 Marks)**

c. Describe the various Quantum structures. **(05 Marks)**

d. What is Carbon nano-tube and write its applications. **(05 Marks)**

10 a. What is Reddy tube and give the characteristics of Reddy tube. **(05 Marks)**

b. Explain the 3 conservation laws and write down the Rankine-Hugoniot equation. **(06 Marks)**

c. Discuss the Bell Milling method of synthesis of Nano-materials. **(05 Marks)**

d. Mention the principle and application of S.E.M. **(04 Marks)**

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