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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, B.E. Make-up Examination; Jan/Feb - 2017

Engineering Physics

(Common to all Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from **each unit**.*

***Physical Constants:** Electron mass = $9.11\text{x}10^{-31}$kg, Planck's constant = $6.63\text{x}10^{-34}$Js, Electron Charge = $1.602\text{x}10^{-19}$C, Boltzmann Constant = $1.38\text{x}10^{-23}$J/K, Avogadro number = $6.025\text{x}10^{26}$/k mole, Permittivity of free space = $8.854\text{x}10^{-12}$ F/m, Velocity of light = $3\text{x}10^{8}$ m/s.*

UNIT - I

1 a. State Bernoulli's Theorem. Mention the limitations of Bernoulli's equation. 8

b. Derive Euler's equation of motion along a stream line flow of the fluid. 7

c. A Dielectric material has polarizability of 7×10^{-40} F-m^2. Assuming the internal field to be Lorentz field, calculate the dielectric constant, if the material has $3\text{x}10^{28}$ atom/m^3. 5

2 a. Explain briefly the four types of Dielectric polarization. 8

b. Define Internal field. Derive Clausius-Mossoti equation for dielectric materials. 7

c. Water flows down through a closed vertical funnel. The flow speed at the top is 12 cm/s and at the bottom is twice the speed at the top. If the funnel is 40 cm long and the pressure at the top is 1.013×10^5 pascle. What is the pressure at the bottom? 5

UNIT - II

3 a. What is ultra-violet catastrophe? Explain the energy distribution in the spectrum of a blackbody. 8

b. Define phase velocity and group velocity. Show that the group velocity of deBroglie wave is equal to the velocity of the particle with which the wave is associated. 7

c. An electron is bound in one dimensional potential well of width 1Å, but of infinite height. Find its energy values in ground state and first two excited states. 5

4 a. State Heisenberg's uncertainty principle, using it prove that the free electron does not exist inside the nucleus of an atom. 8

b. What is wave function? Derive time independent one-dimensional Schrodinger's wave equation. 7

c. Calculate the deBroglie wavelength associated with an electron with a kinetic energy of 2000 eV. 5

Contd…2

UNIT - III

5 a.	Define density of states. Derive an expression for density of states for conduction electrons per unit volume of the material.	8
b.	Define Fermi temperature. Explain the variation of Fermi energy with temperature at T = 0 K and T > 0 K.	7
c.	The mobility of electrons and holes in a sample of Intrinsic germanium at 300 K are 0.36 m2/Vs and 0.14 m^2/Vs respectively. If the resistivity of the specimen is 2.2 Ω-m, Calculate the intrinsic charge carriers concentration.	5
6. a.	Define intrinsic semiconductors. Derive an expression for electron concentration in an intrinsic semiconductor.	8
b.	Explain the significance of Fermi level in n- type and P- type semiconductors.	7
c.	Show that the sum of probability of occupancy of an energy state ΔE, above and below the Fermi level at a given temperature in unity.	5

UNIT - IV

7 a.	What are nanomaterials? Describe the confinement of electron energy states for “Bulk”, “Well” and “Wire” system of Nanomaterials.	8
b.	Explain carbon Nanotubes, and its physical properties with applications.	7
c.	Explain the temperature dependence of critical magnetic field of superconductors.	5
8 a.	What is superconductivity? Describe the Type - I and Type - II super conductors.	8
b.	What is Meinssner’s effect? Describe how BCS theory can explain superconductivity.	7
c.	Describe the construction and working of Scanning Tunneling Microscope.	5

UNIT - V

9 a.	With the energy band diagram, describe the construction and working of Semiconductor Diode Laser.	5
b.	With neat diagram, derive an expression for Numerical Aperture of the optical fibres.	5
c.	Describe the measurement of velocity of ultrasonic waves in liquids.	5
	Explain the acoustic requirements of a good auditorium.	5
10 a.	Explain the factor affecting on good acoustical building and their Remedies.	5
b.	Explain how ultrasonic waves are used to determine flaws in materials by Non-destructive method of testing.	5
c.	With a neat diagram, explain single mode optical fiber and Graded index multi mode optical fiber.	5
	Explain induced absorption, spontaneous emission and stimulated emission of radiation processes.	5

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