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

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; May - 2022

Engineering Physics

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Understand the basic concepts and principles of Physics describing the phenomena associated with Engineering field.

CO2: Explain/Describe the properties of various materials, light and sound related to Engineering applications.

CO3: Formulate/Derive the Expressions for the concepts of Physics pertaining to Engineering field.

CO4: Apply the knowledge of Physics to analyze/solve the numerical problems allied to Engineering field.

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for a Maximum of* ***18 marks*** *from each unit.*

Physical constants: *Electron mass, $m = 9.11\times10^{-31}$ kg, Electron charge, $e = 1.602\times10^{-19}$ C; Velocity of light, $c = 3\times10^{8}$ ms^{-1}; Planck's constant, $h = 6.626\times10^{-34}$ Js; Boltzmann constant, $K = 1.38\times10^{-23}$ JK^{-1}; Avogadro number, $N = 6.025\times10^{23}$/mole; Permittivity of free space, $\varepsilon_o = 8.85\times10^{-12}$ Fm^{-1}.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Write any two properties of wave function.	2			
b.	What is Poisson's ratio? Mention its limit.	2			
c.	Define Fermi factor. Write the equation for Fermi factor.	2			
d.	What is Pumping? Give one example for Pumping.	2			
e.	Define Quality factor. What is its significance?	2			
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	State de-Broglie hypothesis of matter waves. Derive an expression for the de-Broglie wavelength using the concept of matter waves.	9			
b.	Find Eigen function and Eigen values for a particle in one dimensional potential well of infinite height by solving Schrödinger's wave equation.	9			
c.	i) An electron has wavelength of $2\,\mathring{A}$. Find its kinetic energy and group velocity of the de-Broglie wave associated with it.				
	ii) The position and momentum of an electron with energy 1 keV are determined. If the inherent uncertainty in the measurement of its position is $1\,\mathring{A}$, what is the minimum percentage of uncertainty in its momentum?	9			

Contd… 2

UNIT - II **18**

2 a. Define Young's modulus and Rigidity modulus. Obtain the relation between them. 9

b. Derive an expression for Clausius-Mosotti equation. Explain the applications of dielectric in transformers. 9

c. What is Polarization? Explain four Polarization mechanisms in detail. 9

UNIT - III **18**

3 a. Derive an expression for density of states. 9

b. Mathematically prove that for an intrinsic semiconductor, the Fermi level lies in the middle of the band gap. Discuss the cases of Fermi level for an extrinsic semiconductor with a neat diagram. 9

c. What are the postulates of quantum free electron theory? Explain any two success of quantum free electron theory. 9

UNIT - IV **18**

4 a. Explain the construction and working of semiconductor laser with a neat energy level diagram. 9

b. Discuss the principle of light propagation in optical fiber. Derive an expression for the numerical aperture of an optical fiber. 9

c. What is Attenuation? Explain the application of optical fibers in communication system with a neat block diagram. 9

UNIT - V **18**

5 a. What are force oscillatrons? Arrive at the expression for amplitude in case of forced oscillatrons. 9

b. What is Meissner's effect? Explain BCS theory of super conductivity. 9

c. What are ultrasonic waves? Explain the non-destructive method of testing the materials. 9

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