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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; July / Aug. - 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, $m = 9.11x10^{-31}$ kg, Electron charge, $e = 1.602x10^{-19}$ C; Velocity of light, $c = 3x10^{8}$ ms^{-1}; Planck's constant, $h = 6.626x10^{-34}$ Js; Boltzmann constant, $K = 1.38x10^{-23}$ JK^{-1}; Avogadro number, $N = 6.025x10^{23}$/mole; Permittivity of free space, $\varepsilon_o = 8.85x10^{-12}$ Fm^{-1}.*

Q. No.	Questions	Marks	BLs	COs	PIs
	PART - A	**10**			
I a.	What is a black body? Draw the energy distribution curve.	2	L1	CO1	1.2.1
b.	Define tensile stress and shear stress.	2	L1	CO1	1.2.1
c.	Define mobility and Fermi velocity.	2	L1	CO1	1.2.1
d.	Define coherent and incoherent radiations.	2	L1	CO1	1.2.1
e.	Define simple harmonic motion and write a differential equation for S.H.M.	2	L1	CO1	1.2.1
	PART - B	**90**			
	UNIT - I	**18**			
1 a.	Explain phase velocity and group velocity. Deduce the relation between them.	9	L2	CO2	1.2.2
b.	Setup the Schrodinger's time independent one dimensional wave equation and discuss the case of free particle.	9	L2	CO3	12.1.1
c.	i) Prove that the electron does not exist inside the nucleus of an atom.	5	L2	CO2	1.2.2
	ii) A particle of mass 0.65 MeV/c^2 has kinetic energy 80 eV. Find deBroglie wavelength, particle velocity and phase velocity of the deBroglie wave.	4	L2	CO4	2.1.1
	UNIT - II	**18**			
2 a.	State Hooke's law for elasticity. Obtain the expression for bending moment of a beam with rectangular cross section.	9	L1,2	CO1,3	1.2.1 2.1.1
b.	Mention different types of Polarization mechanisms. Derive Clausius-Mosssotti relation for a dielectric solid.	9	L1,2	CO1,3	1.2.1 2.1.1

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c.	i) Explain the applications of dielectrics in transformers.	5	L2	CO2	1.2.2
	ii) A solid elemental dielectrics has a density 3.08 x 10^{28} atoms/m^3 and its relative permittivity is 4. Calculate electronic polarizability.	4	L2	CO4	2.1.2
	UNIT - III	**18**			
3 a.	Define Fermi energy and Fermi factor. Discuss the probability of occupation of energy by electrons at temperatures T > 0 K and T = 0 K using Fermi factor.	9	L1,2	CO1,2	1.2.1 2.1.1
b.	Explain Fermi level in an intrinsic semiconductor. Deduce an expression for intrinsic carrier concentration and conductivity of a semiconductor.	9	L2	CO2,3	1.2.2 2.1.1
c.	What are the merits of a classical free electron theory? Explain how quantum free electron theory overcomes the failures of classifical free electron theory.	9	L1,2	CO1,2	1.2.1 1.2.2
	UNIT - IV	**18**			
4 a.	Explain population inversion for laser action. Deduce the expression for radiant energy density in terms of Einstein's co-efficient.	9	L2	CO2,3	1.2.2 2.1.1
b.	Define acceptance angle and numerical aperture with neat diagram. Derive an expression for numerical aperture in terms of refractive indices of core and cladding of an optical fibre.	9	L1,2	CO1,3	1.2.1 2.1.1
c.	i) Find the ratio of population of two energy levels out of which one corresponds to meta stable state, if the wavelength of light emitted at 330 K is 633 nm.	4	L2	CO4	2.1.2
	ii) Calculate the number of modes that can be propagated inside the optical fibre if core radius 50 μm and wavelength of light 1 μm. Given n_{core}=1.53 and n_{clad} = 1.5.	5	L2	CO4	2.1.2
	UNIT - V	**18**			
5 a.	Explain briefly Type–I and Type–II superconductors.	9	L2	CO2	1.2.2
b.	What are damped vibrations? Discuss the theory of damped vibrations.	9	L1 L2	CO1 CO2	1.2.1 1.2.2
c.	i) Explain the acoustical requirements for the good auditorium.	5	L2	CO2	1.2.2
	ii) Mention the four important application of ultrasonics.	4	L1	CO1	1.2.1

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