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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; May / June - 2019

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:** Answer **FIVE** full questions, selecting **ONE** full question 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	COs	BL	POs
	UNIT - I				
1 a.	State Hooke's law in elasticity. Show that the value of Poisson's ratio must lie between -1 and 0.5 using the relation between three modulli of elasticity.	8	CO1 & CO3	L1	PO1
b.	Define dielectric constant. Explain briefly Ionic and Space charge polarization mechanisms.	7	CO1 & CO2	L1	PO1
c.	What is a beam? Write down the assumptions of bending of a beam.	5	CO1	L1	PO1
2 a.	What is internal field? Derive an expression for internal field in case of one dimensional array of atoms in dielectric solid.	8	CO1 & CO3	L1	PO1
b.	Derive the relation between elastic constants *q, n* and *k.*	7	CO3	L1	PO1
c.	Write a note on Piezoelectricity and Ferroelectricity.	5	CO1	L1	PO1
	UNIT - II				
3 a.	What are matter waves? Derive the expression for de-Broglie wavelength using the concept of matter waves.	8	CO1 & CO3	L1	PO1
b.	Setup time independent one dimensional Schrodinger wave equation.	7	CO2	L1	PO 1
c.	Calculate the de-Broglie wavelength of a 2000 kg automobile travelling at a speed of 50 m/s and a 0.2 kg bullet travelling at a speed of 250 m/s.	5	CO4	L2	PO2
4 a.	Define wave function. Explain its physical significances.	8	CO1 & CO2	L1	PO1
b.	With a neat figure, explain the distribution of energy in the spectrum of a blackbody.	7	CO2	L1	PO1
c.	(i) Define Eigen function and Eigen values. (ii) Find the energy of an electron in the ground state, when it is trapped in an infinite potential well of width 2 Å.	5	CO1 & CO4	L1 & L2	PO1 & PO2

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UNIT - III

5 a.	Derive an expression for the electron concentration in an intrinsic semiconductor.	8	CO3	L1	PO1
b.	Obtain an expression for density of states in solids.	7	CO3	L1	PO1
c.	Explain the variation of resistance or resistivity with temperature in semiconductor.	5	CO2	L1	PO1
6 a.	Define Fermi factor. Explain the variation of Fermi energy with temperature at T = 0 K and T > 0 K.	8	CO1 & CO2	L1	PO1
b.	What are semiconductors? Show that $E_F = \frac{E_g}{2}$.	7	CO1 & CO2	L1	PO1
c.	Mention the assumptions of quantum free electron theory.	5	CO1	L1	PO1

UNIT - IV

7 a.	Define Meissner's effect and describe why is a superconductor termed as a perfect diamagnet?	8	CO1 & CO2	L1	PO1
b.	Write a brief note on Carbon nanotubes and mention its important properties.	7	CO2	L1	PO1
c.	Calculate the critical current for a wire of lead having a diameter of 1 mm at 4.2 K, critical temperature of lead is 7.18 K and $H_0 = 6.5 \times 10^4$ Am^{-1}.	5	CO4	L2	PO2
8 a.	Explain the variation of density of states in 3D, 2D, 1D and 0D system.	8	CO2	L1	PO1
b.	Write a note on : (i) Maglev vehicle and (ii) SQUID's	7	CO2	L1	PO1
c.	Mention the applications of nano-materials.	5	CO1	L1	PO1

UNIT - V

9 a.	Write a note on laser welding and mention their advantages.	5	CO2	L1	PO1
b.	With a neat diagram explain Multimode optical fibers.	5	CO2	L1	PO1
c.	Write a brief note on applications of ultrasonic waves in different fields.	5	CO2	L1	PO1
d.	Explain the acoustic requirements for a good auditorium.	5	CO2	L1	PO1
10 a.	Write a note on Meta stable state and Population inversion.	5	CO2	L1	PO1
b.	Calculate the numerical aperture and angle of acceptance of a given optical fiber, if the refractive indices of core and cladding are 1.563 and 1.498 respectively.	5	CO4	L2	PO2
c.	With a neat diagram, explain how a flaw in a solid material can be detected by non destructive method of testing using ultrasonics?	5	CO2	L1	PO1
d.	Explain the various factors affecting the architectural acoustics of a building.	5	CO2	L1	PO1

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