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Department of Physics

Sapthagiri College of Engineering

Internal Assessment - I

Subject: Engineering Physics
Semester: 2(ECE/ME/BT/CV)
Duration: 1½ hour (**Time:** 10.45am to 12.15pm)

Subject Code: 18PHY22
Max Marks: 30
Date: 16/04/2019

NOTE: 1. ***Answer any two full questions, choosing one from each module.***

Question number		Questions	Marks	BLT	CO'S
		Module – 1 (Oscillations and Waves)			
1.	a)	What are forced oscillations? Obtain an expression for amplitude and phase of a body undergoing forced vibrations.	6	L1 L2	CO1
	b)	What are shock waves? Mention any four applications of shock waves.	5	L1	
	c)	A mass of 0.5 kg causes an extension of 0.03 m in a spring and the system is set for oscillations. Find i) The force constant for the spring ii) angular frequency and iii) Time Period of the resulting oscillations.	4	L3	
		OR			
2.	a)	What is Mach number? Describe the construction and working of Reddy shock tube.	6	L1	CO1
	b)	Derive an expression for equivalent force constant for 2 springs in series. Mention the expression for time period of its oscillations.	5	L2	
	c)	In Reddy shock tube experiment, it was found that, the time taken to travel between the two sensors is 195 μ s. If the distance between the two sensors is 100 mm, find the Mach number. (Velocity of sound is 334 m/s.)	4	L3	
		Module – 2 (Elastic Properties of Materials)			
3.	a)	Define torsion of a body. Derive an expression for couple per unit twist of a solid cylinder.	6	L2	CO2
	b)	State and explain Poisson's ratio. Discuss the limiting values of σ.	5	L1	
	c)	Calculate the force required to produce an extension of 1 mm in steel wire of length 2 meters and diameter 1mm.(Given : Young's modulus for steel $Y = 2 \times 10^{11}$ N/m^2)	4	L3	
		OR			
4.	a)	Define Young's modulus and Derive the relation between *Y, η & σ.*	6	L2	CO2
	b)	What is a beam? Give the different types of beams. Mention the applications of beams in engineering.	5	L1	
	c)	Calculate the angular twist of a wire of length 0.3 m, and radius of 0.2×10^{-3} m when torque of 5×10^{-4} Nm is applied. Rigidity modulus of the material is 8×10^{10} N/m^2.	4	L3	

CO1 : Able to classify various types of oscillations and their implications, the role of Shock waves in various fields Engineering and Technical fields.

CO2 : Recognize the elastic properties of materials for engineering applications.

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Principal
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14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

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Department of Physics
Sapthagiri College of Engineering
Internal Assessment - III

Subject: Engineering Physics
Semester: 2 (EC/ME/BT/CV)
Duration: 1½ hour (**Time:** 10.45am to 12.15pm)

Subject Code: 18PHY22
Max Marks: 30
Date: 10/06/2019

Physical constants: *Velocity of light, $c = 3x10^8\ ms^{-1}$, Planck's constant, $h = 6.625x10^{-34}$ JS, Mass of electron, $m = 9.1x10^{-31}$ kg, Boltzmann's constant, $k = 1.38x10^{-23}\ JK^{-1}$, Avogadro Number, $N_A = 6.023x10^{26}$/ kmole , Charge of electron, $e = 1.6x10^{-19}$ C.*

Answer any <u>two</u> full questions, choosing one from each module

Question number		Questions	Marks	BLT	CO'S
		Module – 4			
1.	a)	Obtain an expression for energy density of radiation under thermal equilibrium condition in terms of Einstein's Coefficients.	6	L2	CO4
	b)	What are Dielectrics? Explain any two types of Polarization with diagram.	5	L1	
	c)	The Average output power of a laser source emitting laser beam of wavelength 6328 Å is 5 mW. Find the number of photons emitted per second by the laser source.	4	L3	
		OR			
2.	a)	Describe the construction of CO_2 laser and explain its working with the help of energy level diagram.	6	L1	CO4
	b)	Derive Clausius-Mossotti equation.	5	L2	
	c)	If NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is $4.3x10^{-8}$ C/m^2, calculate the dielectric constant of NaCl.	4	L3	
		Module – 5			
3.	a)	Discuss two success of Quantum free electron theory.	6	L1	CO5
	b)	Derive an Expression for electrical conductivity of intrinsic semiconductor.	5	L2	
	c)	Find the temperature at which there is 1% probability that a state with an energy 0.5 eV above the Fermi energy is occupied.	4	L3	
		OR			
4.	a)	What is Hall Effect? Derive an expression for Hall Voltage.	6	L1 L2	CO5
	b)	Define Fermi energy. Obtain an expression for Fermi energy at zero Kelvin.	5	L1 L2	
	c)	The resistivity of intrinsic germanium at 27^{0}C is equal to 0.47 Ωm. Assuming electron and hole mobilities as 0.38 and 0.18 m^{2}V^{-1}s^{-1}, Calculate the intrinsic carrier density.	4	L3	

CO4 : Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields

CO5 : Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

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Department of Physics

Sapthagiri College of Engineering

Internal Assessment - II

Subject: Engineering Physics | **Subject Code:** 18PHY22
Semester: 2(ECE/ME/BT/CV) | **Max Marks:** 30
Duration: 1½ hour (Time: 10.45am to 12.15pm) | **Date:**17/05/2019

NOTE: 1. ***Answer any two full questions, choosing one from each part.***

Question number		Questions	Marks	BLT	CO'S
		Part-A			
1.	a)	Explain the concept of divergence with its physical significance & Mention the time varying and static field Maxwell's equations.	6	L1	CO3
	b)	Obtain an expression for numerical aperture of an optical fiber in terms of refractive indices of core and cladding.	5	L2	
	c)	The attenuation of light in an optical fiber is estimated at 2.2 dB/km. What fractional intensity remains after 2 km & 6 km.	4	L3	
		OR			
2.	a)	Explain the different types of optical fibers with suitable diagrams.	6	L1	CO3
	b)	State and derive Gauss divergence theorem.	5	L2	
	c)	Given $\vec{A}=(3x^2+y+az)\hat{a}_x + (bx-5y^3-2z)\hat{a}_y + (2x+cy+3z^2)\hat{a}_z$. For what values of a, b & c the vector is irrotational.	4	L3	
		Part-B			
3.	a)	What are electromagnetic waves? Derive the differential wave equation for electromagnetic waves using Maxwell's equation.	6	L2	CO4
	b)	State and Explain Heisenberg's uncertainty principle. Show that electrons cannot reside inside the nucleus using this principle.	5	L1	
	c)	Calculate the wavelength associated with an electron raised through a potential difference of 2 kV.	4	L3	
		OR			
4.	a)	Explain the transverse nature of electromagnetic waves. Mention the types of polarization of electromagnetic waves.	6	L2	CO4
	b)	Set up one dimensional time independent Schrodinger's wave equation.	5	L1	
	c)	Compute the first three permitted energy values for an electron in a box of width 4 A°.	4	L3	

CO3 : Able to realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.

CO4 : Able to compute Eigen values, Eigen functions of a particles using Time independent 1-D Schrodinger's wave equation and apprehend theoretical background of different types of laser and its applications in various fields.

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