Model Question Paper-II with effect from 2021 (CBCS Scheme)

USN | | | | | | | | | | |

FIRST/SECOND Semester BE Degree Examination
ENGINEERING PHYSICS - 21PHY12/22

TIME: 03 Hours | **Max. Marks: 100**

Note:
1. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
2. Draw neat sketches where ever necessary.
3. **Constants :** Speed of Light "c" = 3 $\times 10^8$ ms^{-1}, Boltzmann Constant "k" = 1.38 $\times 10^{-23}$ JK^{-1}, Planck's Constant "h" = 6.625 $\times$ 10^{-34} Js, Acceleration due to gravity "g" = 9.8 ms^{-2}, Permittivity of free space "ε_0"=8.854 $\times 10^{-12}$ F m^{-1}.

		Module -1	Marks
Q.01	a	Discuss the theory of forced oscillations and hence classify the conditions of variation of amplitude and phase with angular frequency.	9
	b	Illustrate the generation of shock waves using the Reddy shock tube.	6
	c	Given the damping constant of the medium 0.1 kg s^{-1} calculate the amplitude of the oscillations at resonance given the mass attached to the spring-mass oscillator 50 x 10^{-3} kg, the amplitude of the applied periodic force 1N and the period of oscillations 1 second.	5
		OR	
Q.02	a	Applying Hooke's law arrive at the equations for the effective spring constants of Series and Parallel combinations of springs.	8
	b	Enumerate the properties and applications of shock waves.	7
	c	Compare the Mach number of a Jet fighter traveling with 2000 km hr^{-1} with that of a bullet traveling with a velocity of 400 ms^{-1} in the same medium given the speed of sound in the medium 330 ms^{-1}.	5
		Module-2	
Q. 03	a	Discuss the spectral distribution energy in the black body radiation spectrum and hence explain Wien's displacement law.	8
	b	State and Explain Heisenberg's Uncertainty principle and infer on the classical and quantum mechanical measurements.	7
	c	The kinetic energy of an electron is equal to the energy of a photon with a wavelength of 560 nm. Calculate the de Broglie wavelength of the electron.	5
		OR	
Q.04	a	Discuss the motion of a quantum particle in a one-dimensional potential well of the infinite height and of width 'a' and also examine the quantization of energy.	10
	b	Deduce Rayleigh-Jeans law from Planck's Law of radiation.	5
	c	The speed of electron is measured to within an uncertainty of 2 $\times$ 10^4 ms^{-1} in one dimension. What is the minimum width required by the electron to be confined in an atom?	5
		Module-3	
Q. 05	a	Obtain the expression for energy density using Einstein's A and B Coefficients and hence draw infer on the relation $B_{12}=B_{21}$.	8
	b	Discuss the attenuation and various losses in optical fibers.	7
	c	Calculate the number of photons emitted per pulse of duration 1 microsecond given the power output of LASER 3 mW and the wavelength of laser 632.8 nm.	5
		OR	
Q. 06	a	Define Modes of Propagation and RI Profile and Distinguish between the types of optical fibers.	6

	b	Identify the requisites of the CO2 LASER and Explain its construction and working with the help of a neat sketch and band diagram.	9		
	c	Compare the acceptance angle of an optical fiber placed in air and water given the RI of water 1.33 and the RI of core and clad 1.5 and 1.45 respectively.	5		
		Module-4			
Q. 07	a	Explain the Quantum Mechanical modifications to the classical free electron theory of metals to explain the electrical conductivity in solids and its success.	7		
	b	What is Hall effect and illustrate on the determination of the type of charge carriers in semiconductors.	8		
	c	An elemental solid dielectric material has polarizability 7×10^{-40} Fm^{-2}. Assuming the internal field to be Lorentz, calculate the dielectric constant for the material if the material has 3×10^{28} atoms/m^3.	5		
		OR			
Q. 08	a	Deduce the expression for electrical conductivity of a conductor using the quantum free electron theory of metals.	8		
	b	Describe in brief the various types of polarization mechanisms.	7		
	c	Calculate the probability that an energy level at 0.2eV below Fermi level is occupied at temperature 500K.	5		
Module-5					
Q. 09	a	Define nano-material and classify the nano-materials based on the dimensional constraints.	5		
	b	Describe the construction and working of Scanning Electron Microscope with the help of a neat diagram.	10		
	c	X-rays are diffracted in the first order from a crystal with d spacing 2.8×10^{-10} m at a glancing angle 60 °. Calculate the wavelength of X-rays.	5		
		OR			
Q. 10	a	Mention the principle and applications of X-ray photoelectron spectroscope.	5		
	b	Illustrate the working of Transmission Electron Microscope.	10		
	c	Determine the crystallite size given the Wavelength of X-Rays 10 nm , the Peak Width 0.5 °and peak position 25 ° for a cubic crystal given K = 0.94.	5		

Table showing the Bloom's Taxonomy Level, Course Outcome and Program Outcome

Question		Bloom's Taxonomy Level attached	Course Outcome	Program Outcome
Q.1	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.2	(a)	L3	1	1,2,12
	(b)	L1	1	1,2
	(c)	L3	1	1,2
Q.3	(a)	L1	2	1,2,12
	(b)	L3	2	1,2,12
	(c)	L3	2	1,2
Q.4	(a)	L3	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L3	2	1,2
Q.5	(a)	L4	3	1,2
	(b)	L2	3	1,2
	(c)	L3	3	1,2
Q.6	(a)	L4	3	1,2
	(b)	L2	3	1,2
	(c)	L3	3	1,2
Q.7	(a)	L2	4	1,2

	(b)	L4	4	1,2
	(c)	L3	4	1,2
Q.8	(a)	L2	4	1,2
	(b)	L2	4	1,2
	(c)	L3	4	1,2
Q.9	(a)	L1	5	1,2
	(b)	L2	5	1,2,12
	(c)	L3	5	1,2
Q.10	(a)	L2	5	1,2
	(b)	L2	5	1,2,12
	(c)	L3	5	1,2

Bloom's Taxonomy Levels			
	Lower order thinking skills		
	Remembering (knowledge):L_1	Understanding (Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6