U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: I**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22PH1BSPCV **Max Marks: 100**
Course: Applied Physics for Civil Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Physical constants:

Mass of electron, $m_e = 9.1\times10^{-31}$ kg
Electronic charge, $e = 1.602\times10^{-19}$ C
Boltzmann constant, $k_B = 1.38\times10^{-23}$ J/K
Permittivity of free space$=8.85\times10^{-12}$ F/m
Speed of light, $c = 3\times10^{8}$ m/s
Planck constant, $h = 6.626\times10^{-34}$ Js
Mass of neutron, $m_n = 1.67\times10^{-27}$ kg
Mass of proton, $m_p = 1.67\times10^{-27}$ kg

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		MODULE - I	CO	PO	Marks
1	a)	Derive an expression for the energy density of radiation under equilibrium conditions in terms of Einstein's coefficients.	CO 1	PO 1	**08**
	b)	Discuss the conditions required for laser action. Explain the application of laser in laser range finder.	CO 1	PO 1	**08**
	c)	The average output power of laser source emitting a laser beam of wavelength 632.8 nm is 5 mW. Find the number of photons emitted per second by the laser source.	CO 1	PO 2	**04**
		OR			
2	a)	With neat diagrams explain the different types of optical fibers.	CO 1	PO 1	**08**
	b)	What is numerical aperture? Derive an expression for the numerical aperture of an optical fiber.	CO 1	PO 1	**08**
	c)	Find the attenuation in an optical fiber of length 0.5 km, when a light signal of power 100 mW emerges out of the fiber with a power 90 mW.	CO 1	PO 2	**04**
		MODULE - II			
3	a)	Define Simple harmonic motion and mention any two examples. Derive the differential equation for SHM.	CO 1	PO 1	**08**
	b)	What are damped oscillations? Give the theory of damped vibrations and find the condition for critical damping.	CO 1	PO 1	**08**

		c)	A vibrating system of natural frequency 500 Hz, is forced to vibrate with a periodic force/unit mass of amplitude 100×10^{-5} N/kg in the presence of damping factor 0.01×10^{-3} rad/s. Calculate the maximum amplitude of the system.	*CO 1*	*PO 2*	**04**
			MODULE - III			
	4	a)	What are Miller indices? Derive an expression for inter planar spacing in terms of Miller indices.	*CO 1*	*PO 1*	**08**
		b)	Describe the construction and working of Bragg's spectrometer.	*CO 1*	*PO 1*	**08**
		c)	Draw the following planes in a cubic unit cell (100), (102), (011) and (111).	*CO 1*	*PO 2*	**04**
			OR			
	5	a)	Obtain the relation between atomic radius and lattice constant for SC and BCC structures.	*CO 1*	*PO 1*	**08**
		b)	Describe the principle, construction and working of the X-ray Photoelectron Spectroscope.	*CO 1*	*PO 1*	**08**
		c)	Calculate the crystal size when the peak width is 0.5° and the peak position is 25° for a cubic crystal, the wavelength of the X-ray used is 10 nm and Scherer's constant k=0.94.	*CO 1*	*PO 2*	**04**
			MODULE - IV			
	6	a)	State Hooke's law and explain different moduli of elasticity.	*CO 1*	*PO 1*	**08**
		b)	Derive an expression for couple per unit twist of a solid cylinder.	*CO 1*	*PO 1*	**08**
		c)	Calculate the torque required to twist a wire of length 1.5 m and radius 0.05×10^{-2} m through an angle $\pi/45$ radian. Given rigidity modulus of the material of the material of wire is 8×10^{10} N/m^2.	*CO 1*	*PO 2*	**04**
			MODULE - V			
	7	a)	What are Earthquakes and Tsunamis? Mention the adverse effects and engineering structures to withstand earthquakes and tsunamis.	*CO 1*	*PO 1*	**08**
		b)	What is landslide? Mention the causes and explain the engineering solutions for landslides.	*CO 1*	*PO 1*	**08**
		c)	The magnitude of the earthquake that occurred in Latur during the year 1993 was 6.2. Calculate the seismic moment of the earthquake.	*CO 1*	*PO 2*	**04**

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