U.S.N.										

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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

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

Physical constants:

Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg
Electronic charge, $e = 1.602 \times 10^{-19}$ C
Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K
Permittivity of free space$=8.85 \times 10^{-12}$ F/m
Speed of light, $c = 3 \times 10^8$ m/s
Planck constant, $h = 6.626 \times 10^{-34}$ Js
Mass of neutron, $m_n = 1.67 \times 10^{-27}$ kg
Mass of proton, $m_p = 1.67 \times 10^{-27}$ kg

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

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.

		UNIT - I	CO	PO	Marks
1	a)	Derive an expression for the energy density of radiation under equilibrium conditions in terms of Einstein's coefficients.	CO1	PO1	**8**
	b)	With a neat diagram explain the different types of optical fibers.	CO1	PO1	**8**
	c)	The average output power of a 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.	CO1	PO2	**4**
		OR			
2	a)	Describe the construction and working of semiconductor LASER with an energy level diagram	CO1	PO1	**8**
	b)	What is attenuation in an Optical fiber? Explain the factors contributing to the fiber loss.	CO1	PO1	**8**
	c)	The angle of acceptance of an optical fiber is 30^o when kept in air. Find the angle of acceptance when it is kept in a medium of refractive index 1.33.	CO1	PO2	**4**
		UNIT - II			
3	a)	Define simple harmonic motion and mention any two examples. Derive the differential equation for SHM.	CO1	PO1	**8**
	b)	What are forced oscillations? Obtain an expression for the amplitude of forced oscillations.	CO1	PO1	**8**
	c)	A mass of 2 kg is suspended by a spring of force constant 51.26 N/s executing damped oscillations with a damping of 5kg/s. Identify whether it is a case of underdamping or overdamping. Also, estimate the value of damping required for the oscillations to be critically damped.	CO1	PO2	**4**

			UNIT - III			
	4	a)	What are Miller indices? Derive an expression for interplanar spacing in terms of Miller indices.	*CO1*	*PO1*	**8**
		b)	Describe the construction and working of the Bragg's X-ray diffractometer.	*CO1*	*PO1*	**8**
		c)	Calculate the atomic packing factor for BCC structure.	*CO1*	*PO2*	**4**
			OR			
	5	a)	Obtain the relation between atomic radius and lattice constant for BCC and FCC structures.	*CO1*	*PO1*	**8**
		b)	Describe the principle, construction and working of the X-ray photoelectron spectroscope.	*CO1*	*PO1*	**8**
		c)	Draw the following planes in a cubic unit cell (1 0 0), (0 0 2), (1 1 0) and (1 3 2).	*CO1*	*PO2*	**4**
			UNIT - IV			
	6	a)	State Hooke's law and explain different moduli of elasticity	*CO1*	*PO1*	**8**
		b)	Derive an expression for a couple per unit twist of a solid cylinder.	*CO1*	*PO1*	**8**
		c)	A rectangular material rod of length 0.5 meters, breadth 2 cm, and thickness 1 cm is used as a single cantilever. If a load of 2 kg is applied at its free end the depression produced is 0.44 cm, calculate the Young's modulus of the material of the rod.	*CO1*	*PO2*	**4**
			UNIT - V			
	7	a)	What is tsunami wave? Mention the causes and engineering solutions for tsunami waves.	*CO1*	*PO1*	**8**
		b)	What is a landslide? Mention the causes and adverse effects of landslides.	*CO1*	*PO1*	**8**
		c)	The intensity of one earthquake is 100 times the intensity of the other. If the magnitude of the first earthquake is 8.9, estimate the magnitude of the other.	*CO1*	*PO2*	**4**

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