U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2023 Semester End Make-Up Examinations

Programme: B.E. **Semester: I**
Branch: CV **Duration: 3 hrs.**
Course Code: 22PH1BSPCV **Max Marks: 100**
Course: Applied Physics for Civil Engineering Stream **Date:16.08.2023**

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

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

Module-I

1	a)	Obtain an expression for energy density of a system under thermal equilibrium condition in terms of Einstein's co-efficients.	08
	b)	With a neat diagram, explain single mode step index fiber and graded index multimode fiber.	08
	c)	Find the ratio of population of two energy levels out of which one corresponds to metastable state, if the wavelength emitted at 330K is 632.8 nm.	04

OR

2	a)	With a neat diagram derive an expression for angle of acceptance and numerical aperture in terms of refractive indices of core and cladding of an optical fiber.	08
	b)	Describe the construction and working of a semiconductor diode laser.	08
	c)	Find the attenuation in an optical fiber of length 500 m, when a light signal of power 100 mW emerges out of the fiber with a power 90 mW.	04

Module-II

3	a)	Define simple harmonic motion, free vibration, damped vibration and forced vibration with an example each.	08
	b)	Obtain an expression for the amplitude of forced vibration.	08
	c)	A 20 g oscillator with natural angular frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. If the damping coefficient is 0.17 kg/s, how does the oscillator decay?	04

Module- III

4 a) What are Miller indices? Derive an expression for interplanar spacing in terms of Miller indices. **08**

b) Describe how Bragg's X-ray diffractometer is used to determine the wavelength of an X-ray beam. **08**

c) Draw the following (100), (110), (111) and (200) planes in a cubic unit cell. **04**

OR

5 a) Discuss briefly the principle, construction and working of X-ray Photoelectron Spectroscopy. **08**

b) Define Packing factor. Calculate the packing factor for BCC and FCC crystals. **08**

c) Using a Bragg's spectrometer, the glancing angle for the first order spectrum was observed to be equal to 6^0. Find the wavelength of X-ray if $d = 2.82\ \overset{0}{A}$. **04**

Module-IV

6 a) What is bending moment of a beam? Deduce an expression for the bending moment of a beam. **08**

b) Derive an expression for couple per unit twist of a solid cylinder. **08**

c) A wire of 3 m long and $0.625 \times 10^{-4}\ m^2$ in cross section is found to stretch 0.003 m under a tension of 1200 kg. What is the Young's modulus of the material of the wire? **04**

Module-V

7 a) Write a brief note on types of landslides. **08**

b) What are fire hazards? Discuss the causes for fire hazards. **08**

c) An earth quake registered with a magnitude of 7.2 and the assigned minimal measure released by an earth quake is $10^{11.8}$. Calculate the energy of the earth quake. **04**

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