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B.Tech DEGREE EXAMINATION, JANUARY 2024

First Semester

21PYB101J - PHYSICS: ELECTROMAGNETIC THEORY, QUANTUM MECHANICS, WAVES AND OPTICS

(For the candidates admitted during the academic year 2022-2023 onwards)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 75**

PART - A (20 × 1 = 20 Marks) — Answer **all** Questions

		Marks	BL	CO
1.	The vector field whose curl is zero is called ..... (A) Irrotational (B) Rotational (C) Conservative (D) Solenoid	1	1	1
2.	In free space, the Poisson's equation becomes..... (A) Maxwell's equation (B) Ampere's equation (C) Laplace's equation (D) Steady state equation	1	1	1
3.	Dielectrics are..... (A) Electric insulators (B) Electric conductors (C) Materials that work under low voltages (D) Hole conductors	1	1	1
4.	..... is the ratio of the permittivity of the medium and the permittivity of free space (A) Polarization vector (B) Dielectric constant (C) Polarizability (D) Electronic polarization	1	1	1
5.	Ferrites are the modified structure of --- (A) Cobalt (B) Nickel (C) Iron (D) Gold	1	1	2
6.	Magneto resistance is the property of a material to change the value of ---------- (A) Magnetic moment (B) Magnetism (C) Mobility (D) Electrical resistance	1	1	2
7.	Bubble memory is a ---------- memory (A) Non-volatile (B) Permanent (C) Temporary (D) Semiconductor	1	1	2
8.	When the coercivity and retentivity of a magnetic material is large, then they are called as -------- --- magnetic materials. (A) Para (B) Dia (C) Hard (D) Soft	1	2	2
9.	..... effect refers to the change in the wavelength of scattered X-rays by a material. (A) Photoelectric effect (B) Compton effect (C) de Broglie concepts (D) Wien's radiation	1	2	3

10.	The existence of matter wave is experimentally proved by ..... and	1	2	3
	(A) Raman and deBroglie (B) Davisson and Germer (C) de Broglie and Germer (D) Fresnel and Raman			
11.	The ..... effect is a phenomenon in which electrons are ejected from the surface of a metal when light is incident on it.	1	1	3
	(A) Photoelectric (B) Compton effect (C) de Broglie concept (D) Wien's radiation			
12.	A perfect blackbody is said to be a system which_____ all possible wavelengths of radiation.	1	1	3
	(A) Transmits (B) Absorbs and Emits (C) Diffracts (D) Creates photon with			
13.	The main principle used in interference is _____	1	1	4
	(A) Heisenberg's Uncertainty Principle (B) Superposition Principle (C) Quantum Mechanics (D) Fermi Principle			
14.	How many lenses are used in Fresnel Diffraction?	1	1	4
	(A) Two Convex lenses (B) Two Concave lenses (C) One Convex lens (D) No lens used			
15.	What should be the phase difference between the two plane-polarized waves, vibrating at right angles to each other, to produce circularly polarized light?	1	1	4
	(A) $\pi/6$ (B) $\pi/2$ (C) $\pi/4$ (D) $\pi/3$			
16.	The wavelength range for a grating is _____	1	1	4
	(A) 200 nm – 400 nm (B) 400 nm – 800 nm (C) 800 nm – 1200 nm (D) 200 – 800 nm			
17.	Which of the following can be used for the generation of laser pulse?	1	1	5
	(A) Ruby laser (B) Nd- YAG laser (C) Carbon dioxide laser (D) Helium neon laser			
18.	What is the principle of fibre optical communication?	1	1	5
	(A) Frequency modulation (B) Population inversion (C) Total internal reflection (D) Doppler effect			
19.	Which of the following loss occurs inside the fibre?	1	1	5
	(A) Radiative loss (B) Scattering (C) Absorption (D) Attenuation			
20.	Which characteristic of LASER allows it to be used in holography?	1	1	5
	(A) Coherency (B) Directionality (C) Intensity (D) Monochromaticity			

PART - B (5 × 8 = 40 Marks)

Answer **all** Questions

		Marks	BL	CO
21.	(a) State Gauss law. Apply Gauss law, find the electric field intensity due to line charge of infinite length.	8	2	1
	(OR)			
	(b) Explain the frequency and temperature dependence of various polarization mechanism			
22.	(a) Illustrate the concept of TMR and CMR	8	2	2
	(OR)			
	(b) What is magnetic bubble memory (MBM)? Explain the principle and working of MBM and write their uses			

23.	(a) a. Find the de-Broglie wavelength in terms of energy and voltage. 4Mark b. Discuss the photoelectric effect with neat diagram. 4Mark **(OR)** (b) Explain how Davisson-Germer experiment proves the wave nature of electrons.	8	3	3
24.	(a) Distinguish between interference and diffraction with neat sketch Any four difference **(OR)** (b) Describe the plane polarized, circularly polarized and elliptical polarized light with neat diagram?	8	2	4
25.	(a) Explain the Einstein's theory of spontaneous and stimulated emission. **(OR)** (b) Explain the applications of Fiber optic in communication system and Industries	8	1	5

	Marks	**BL**	**CO**

PART - C (1 × 15 = 15 Marks)

Answer **any 1** Questions

26.	Derive the Eigen value and a wave equation for a particle enclosed in a one dimensional potential box	15	3	3
27.	Illustrate the spinel and inverse spinel structure of ferrites with an example and neat diagram. List any four properties of ferrites	15	3	2

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