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FIFTH SEMESTER (CUFYUGP) DEGREE EXAMINATION NOVEMBER 2026

APPLIED PHYSICS / PHYSICS

PHY5EJ302(1)/ APH5EJ304(2) Materials Science

2024 Admission onwards

Maximum Time :2 Hours **Maximum Marks :70**

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	List six different property classifications of materials that determine their applicability.
2	Explain why the properties of polycrystalline materials are most often isotropic.
3	Explain the principle of Raman spectroscopy.
4	What are advanced materials? Explain their importance in modern technology.
5	What is Hall effect and mention two practical applications.
6	What are nanocrystalline solids? Mention any two advantages .
7	What is total internal reflection and its application in optical fibres.
8	Explain polarization mechanisms in dielectrics.
9	Define electrical conductivity and resistivity. Write the relation between them.
10	What is magnetometry? Name any three techniques used for measuring magnetic moment.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling : 36 Marks)

11	Schematically plot the attractive repulsive and net energies versus Inter atomic separation for two atoms or ions. Note on this plot the equilibrium separation and binding energy.
12	The net potential energy E_N between two adjacent ions is represented by the expression E_N=-C/r+D$e^{-r/\rho}$ in which r is the interionic separation and C, D, and are constants whose values depend on the specific material. (a) Derive an expression for the bonding energy E_0 in terms of the equilibrium interionic separation r_0 and the constants D and ρ
13	Determine the expected diffraction angle for the first-order reflection from the (113) set of planes for FCC platinum when monochromatic radiation of wavelength 0.1542 nm is used.
14	Explain the classification of magnetic materials. Discuss their properties and applications in engineering.
15	The metal iridium has an FCC crystal structure. If the angle of diffraction for the (220) set of planes occurs at 69.22° (first-order reflection) when monochromatic X-radiation having a wavelength of 0.1542 nm is used, compute (a) the interplanar spacing for this set of planes

	and (b) the atomic radius for an iridium atom.
16	Describe the interaction of materials with electromagnetic radiation. Explain the optical properties of materials used in optical devices.
17	Classify magnetic materials into diamagnetic, paramagnetic, ferromagnetic and ferrimagnetic
18	Explain oxidation and corrosion of materials. Discuss different methods for corrosion prevention.
Section C	
Answer any ONE .Each Question carries 10 marks (1x10=10 Marks)	
19	Describe ionic, covalent, metallic, hydrogen and Van Der waals bonds. Note which materials exhibit each of these bonding types.
20	Describe the atomic structure within the vicinity of (a) a grain boundary and (b) a twin boundary.