QP Code: D153954	**Total Pages: 2**	**Name:**
		Register No.

FIFTH SEMESTER (CUFYUGP) DEGREE EXAMINATION, NOVEMBER 2026

PHYSICS / APPLIED 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	Mention the four components that are involved in the design, production and utilisation of materials and briefly describe the inter relationships between these components.
2	Name three criteria that are important in the materials selection process
3	Describe both vacancy and self-interstitial crystalline defects.
4	Define electrical conductivity and resistivity. What is the unit of conductivity?
5	What are dislocations? Explain their significance in determining the mechanical properties of materials.
6	What are electrochemical techniques? State their importance in materials characterization.
7	Define dielectric constant and dielectric loss.
8	What is total internal reflection and its application in optical fibres.
9	What is Raman scattering? Why is Raman spectroscopy useful for materials characterization?
10	What is the Hall effect? Mention any two applications of Hall-effect measurements in semiconductors.

Section B

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

11	Describe various crystal imperfections. Explain point defects, dislocations, interfacial defects and volume defects.
12	a) Briefly cite to the main differences between ionic covalent and metallic bonding b) State the Pauli exclusion Principle.
13	The net potential energy between two adjacent ions, E_N, may be represented by $E_N=-A/r+B/r^n$, Calculate the bonding energy E_0 in terms of the parameters A, B, and n.
14	Compare polymer, ceramic and glass as insulators.
15	Explain the classification of engineering materials. Discuss the characteristics and applications of metals, ceramics, polymers, composites and advanced materials.

16	For BCC iron, compute (a) the interplanar spacing and (b) the diffraction angle for the (220) set of planes.The lattice parameter for Fe is 0.2866 nm. Also, assume that monochromatic radiation having a wavelength of 0.1790 nm is used, and the order of reflection is 1
17	Draw and explain B-H Hysterisis loop for soft iron and hard steel. Why is soft magnetic material used for transformer core and hard for permanent magnet?
18	Explain the principle of photoluminescence spectroscopy and discuss the information that can be obtained from a photoluminescence spectrum.
Section C	
Answer any ONE .Each Question carries 10 marks (1x10=10 Marks)	
19	Explain various characterization techniques used in materials science with suitable examples.
20	Explain the band structure of conductors, insulators and semiconductors with neat diagrams.