U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Institutional Elective **Duration: 3 hrs.**

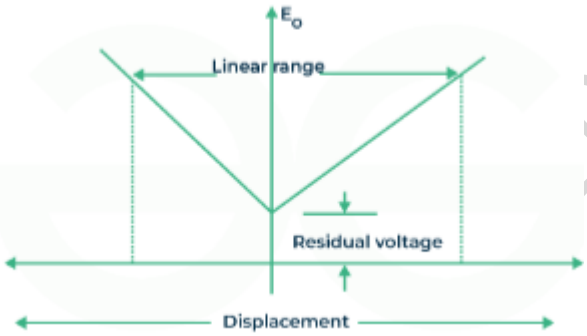
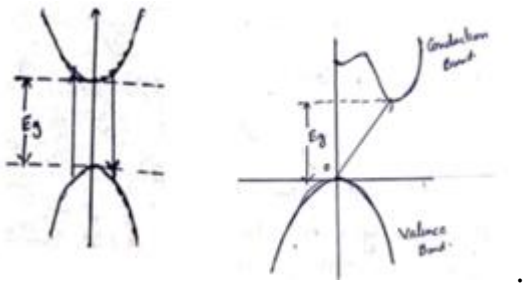
Course Code: 22EC7OE2EM **Max Marks: 100**

Course: Engineering Materials and Sensors

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

aImportant 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)	Classify the engineering materials and depict the interplay between the groups based on applications**.**	CO 1	-	**10**
	b)	A reaction with activation energy equal to 100 kJ mol–l takes 50 min for completion at 300 K. At what temperature will it be complete in 5 min?	CO 1	PO1	**5**
	c)	The electrical properties of a solid material are a consequence of its electron band structure". Justify the statement with necessary diagrams.	CO 1	PO1	**5**
		OR			
2	a)	What are the factors that contribute to the occurrence of any spontaneous reactions to occur with relevant equations.	CO1	-	**10**
	b)	Consider a reaction between different atomic species A, B and C. Let atom A interact with molecule BC to produce molecule AB and atom C: A + BC ⟶ AB + C. Highlight the significance of activation energy for the above reaction.	CO 1	PO1	**10**
		UNIT - II			
3	a)	Suggest and describe a suitable material deposition technique where metal can be converted into gaseous form and then deposited on the surface of the sample. Also mention the advantages of the same.	CO 1	PO1	**10**
	b)	"Polyethylene is used for fabrication of infrared windows and lenses". Justify the statement. Show the depiction of polymer composition.	CO 1	PO1	**10**

			OR			
	4	a)	Suggest and describe a suitable deposition technique in which a thin film is deposited on a surface through the chemical reaction of gaseous precursor(s) at high temperatures. What are the advantages of the same?	***CO 1***	***PO1***	**10**
		b)	"Beryllium has several remarkable properties". Justify the statement highlighting the significance of metals and non metals with the properties	***CO 1***	***PO1***	**10**
			UNIT - III			
	5	a)	Analyze the characteristics in Fig 1. With respect to the displacement sensor  Fig-1	***CO2***	***PO2***	**10**
		b)	Describe the working principle and modes of a microscope which has high resolution and can measure in fractions of nanometer.	***CO2***	***PO2***	**10**
			OR			
	6	a)	Analyze the working of a sensor whose resistance is a function of applied strain.	***CO2***	***PO2***	**10**
		b)	Describe the working principle of X Ray diffraction grating.	***CO2***	***PO2***	**10**
			UNIT - IV			
	7	a)	With relavant equations outline the absorption process in materials and comment on the plots given in Fig-2  Fig-2	***CO1***	***PO1***	**10**
		b)	Discuss the principle of luminescence Classify the types and explain the same.	***CO1***	***PO1***	**10**

			OR			
	8	a)	Describe a phenomenon which occurs when an incident light impinges on a semiconductor and increases the electric conductivity, with suitable equations.	***CO1***	***PO1***	**10**
		b)	Discuss the refraction principle with suitable expressions.	***CO1***	***PO1***	**10**
			UNIT - V			
	9	a)	Illustrate the various energy band structures in solids.	***CO1***	***PO1***	**10**
		b)	Describe the electrical characteristics of an alloy. Represent the temperature dependance of carrier concentration in Germanium and Silicon.	***CO1***	***PO1***	**10**
			OR			
	10	a)	Suggest a method to find the semiconductor type, concentration of majority charge carriers and mobility of such charge carriers	***CO1***	***PO1***	**10**
		b)	Illustrate the variation of dielectric constant with frequency of an alternating electric field.	***CO1***	***PO1***	**10**

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