PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 29-05-2025   **Time:** 01:00 pm – 04:00 pm

School: **SOE**	Program: B. Tech, II SEM (CIV,MEC & PET)	
Course Code: PHY1001	**Course Name:** Material Physics	
Semester: II	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	23	22	23	22	

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **10Q x 2M=20M**

1.	Define coordination number.	2 Marks	**L1**	**CO1**
2.	Briefly explain the **primary bonds** found in solids.	2 Marks	**L1**	**CO1**
3.	What is the role of **X-ray diffraction** in materials science?	2 Marks	**L1**	**CO1**
4.	Explain the **Seebeck effect**.	2 Marks	**L1**	**CO3**
5.	What are the **factors affecting the corrosion rate**?	2 Marks	**L1**	**CO3**
6.	Convert the temperature of **70 °C** into both the **Kelvin** and **Fahrenheit** scales.	2 Marks	**L1**	**CO3**
7.	What is a **nanomaterial**?	2 Marks	**L1**	**CO4**
8.	Define the term **"surface-to-volume ratio"** in the context of nanomaterials.	2 Marks	**L1**	**CO4**
9.	What is **hardness**?	2 Marks	**L1**	**CO2**
10.	A body is compressed to **1/10th of its original volume**. What is the resulting **volumetric strain** on the body?	2 Marks	**L1**	**CO2**

Part B

Answer the Questions.   **Total Marks 80M**

11.	a.	Explain the Bravais crystal systems along with the relationships between their lattice parameters and angles.	10 Marks	L2	CO1
	b.	Explain the differences between crystalline and amorphous solids.	5 Marks	L2	CO1
	c.	Define dislocation and describe the concept of edge dislocation.	5 Marks	L2	CO1
		Or			
12.	a.	What are miller indices? How they are obtained? Draw the (010) (120) and (111) planes and the [011] [010] and [112] directions of a simple cubic crystal.	10 Marks	L3	CO1
	b.	Find the atomic packing factor of FCC structure?	5 Marks	L2	CO1
	c.	What are point defects in crystals? Describe the various types of point defects.	5 Marks	L2	CO1

13.	a.	Draw the stress-strain curve for a metal and explain the different regions of the curve in detail.	10 Marks	L2	CO2
	b.	On increasing the length by 0.5 mm in a steel wire of length 2 m and area of cross-section 2 mm², the force required is? [Y for steel $= 2.2 \times 10^{11} \, N/m^2$]	5 Marks	L3	CO2
	c.	Classify metals, ceramics, and polymers based on their properties and give examples.	5 Marks	L2	CO2
		Or			
14.	a.	Explain the difference between Resilience and Toughness of solid material using stress –strain graph.	10 Marks	L2	CO2
	b.	Explain anelastic, viscoelastic, and elasto-plastic behavior of materials with neat diagrams.	5 Marks	L2	CO2
	c.	An elastic spring, designed for high-impact vehicles, is subjected to a load of 102 kg distributed over a surface area of 2000 cm². Your supervisor requires the stress to be calculated in kilopascals (kPa) to align with the company's standard reporting format. Can you determine the stress accurately? (g = 9.8 m/s2, 1 kg·m/s² = 1 Newton (N), 1 Pascal (Pa)=1 N/m²).	5 Marks	L3	CO2

15.	a.	Explain the different heat conduction processes with suitable examples.	10 Marks	L2	CO3
	b.	Derive the relation between the linear thermal expansion coefficient and the areal thermal expansion coefficient.	5 Marks	L2	CO3
	c.	The thermal conductivity of copper is 390 W m^{-1} K^{-1}. Calculate the rate of heat transfer through a copper wire with area 4.0 cm² and length 0.50 m. The temperature difference between both of the ends of the wire is 30 °C.	5 Marks	L2	CO3
		Or			
16.	a.	Explain different types of corrosion with examples.	10 Marks	L2	CO3
	b.	A metal rod is 64.522 cm long at 12 °C and 64.576 cm at 90 °C. Find the coefficient of linear expansion of its material.	5 Marks	L3	CO3

	c.	Define heat capacity, specific heat capacity, and thermal conductivity.	**5 Marks**	L2	CO3

17.	a.	Explain how size reduction to the nanoscale affects the chemical, physical, optical, magnetic, and thermal properties of materials.	**10 Marks**	L2	**CO4**
	b.	Explain the difference between the top-down and bottom-up approaches in nanomaterial synthesis.	**5 Marks**	L2	**CO4**
	c.	List and explain a few characterization techniques used to study nanomaterials, along with their applications.	**5 Marks**	L2	**CO4**
		Or			
18.	a.	Explain the classification of nanomaterials with examples?	**10 Marks**	L2	**CO4**
	b.	What are carbon nanotubes (CNTs)? Describe the structures of single-walled and multi-walled carbon nanotubes.	**5 Marks**	L2	**CO4**
	c.	Write brief note on applications of Carbon nanotubes?	**5 Marks**	L2	**CO4**