

Roll No. ....

Total Pages : 03

**CMDQ/M-20**

**5656**

**MATERIALS SCIENCE-II**

**PHY-404C**

Time : Three Hours]

[Maximum Marks : 60

**Note :** Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

**(Compulsory Question)**

1. (a) What do you mean by Hardenability ? How does it differ from Hardness ? Explain. **3**
- (b) The Larmor frequency is quantized or not ? Explain. **3**
- (c) Paramagnetism in metals is weak and independent of temperature. Explain. **3**
- (d) Calculate the wavelength associated with electron beam accelerated through 100 kV ? **3**

**Unit I**

2. (a) What is necking criteria ? Discuss the method of Considere's construction for determining the point of maximum load. **8**

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- (b) Define true stress and true strain. Establish the relation of true stress with engineering stress and true strain with engineering strain. 4
- 3. (a) Define Hardness. How will you determine the hardness of a material using Knoop hardness test ? How is it different from Mayer hardness test ? 9
- (b) How hardness of a material is related to its flow properties ? 3

## **Unit II**

- 4. (a) What are density-of-states curves for a metal ? On the basis of these curves explain why the Paramagnetism in metals is weak and independent of temperature. 8
- (b) What is the importance of Curie-Weiss Law ? 4
- 5. (a) What is Neel Temperature ? How can it be determined ? 8
- (b) Why the resonance frequencies encountered in EPR are many times larger than those required for NMR ? 4

### **Unit III**

6. (a) What are ferroelectric materials ? How are they classified ? Explain giving suitable examples. **8**  
(b) What are Ferroelectric Domains ? Explain its physical significance. **4**
7. (a) Discuss the Landau theory for second order Phase Transitions. **8**  
(b) Discuss the phenomenon of antiferroelectricity. **4**

### **Unit IV**

8. (a) How will you define a 'Surface' ? What is its importance ? **3**  
(b) Discuss the basic principle, instrumentation and working of Glancing angle X-ray Diffraction (GXRD) technique. Give suitable examples. **9**
9. (a) What is X-ray Photoelectron Spectroscopy (XPS) ? Explain the basic principle and instrumentation involved in this technique. How will you identify the Chemical shift ? Explain. **9**  
(b) Can you detect hydrogen in the surface of a material using AES technique ? Explain. **3**