

**B. TECH DEGREE EXAMINATIONS: JUNE 2010**

Second Semester

**ELECTRONICS AND COMMUNICATIONS ENGINEERING**

PHY105: Materials Science

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL Questions:-**

**PART A (10 x 1 =10 Marks)**

1. The expression for electrical conductivity in a metal is  
(a)  $\tau nem$                       (b)  $ne^2 \tau / m$                       (c)  $ne^2 m / \tau$                       (d)  $e^2 \tau$
2. In meissner effect the magnetic susceptibility (x) of a super conductor is  
(a) 0                      (b) +1                      (c) -1                      (d)  $\infty$
3. The method of depositing a mono crystalline film on a mono crystalline substrate is called  
(a) etching                      (b) epitaxy                      (c) doping                      (d) diffusion
4. Maximum number of circuits enclosed in an integrated circuit is  
(a) ASI                      (b) MSI                      (c) LSI                      (d) VLSI
5. Susceptibility of a paramagnetic material is proportional to (T is the temperature in Kelvin scale) is  
(a)  $1/T$                       (b) T                      (c)  $1/T^2$                       (d)  $T^2$
6. The electronic Polaris ability and temperature of the dielectric are  
(a) Directly proportional      (b) Inversely proportional      (c) Independent      (d) Same
7. Two Phases involved in shape memory alloy are  
(a) Pearlite & monolite                      (b) Ausenite & Martensite  
(c) Tridite & Dilite                      (d) Austenite & Pearlite
8. Nano materials have superior properties when compared to bulk materials because of  
(a) its large surface area for interaction                      (b) its small size for interaction  
(c) its small volume                      (d) its small surface area
9. Phosphorescence is a  
(a) Phosphate Resin      (b) delayed fluorescence      (c) pH value      (d) Nanomaterial
10. Second harmonic generation is achieved by passing a radiation from Nd: YAG laser through  
(a) Calcite                      (b) Quartz                      (c) KDP                      (d) Nicol prism

**PART B (10 x 2 =20 Marks)**

11. What do you mean by relaxation time of an electron in an electron gas inside a conductor?
12. Distinguish between Type I and Type II superconductors?
13. Explain the terms masking and etching in Fabrication of ICs.
14. What do you mean by monolithic and hybrid circuits?
15. What is a bubble memory?
16. Sketch the variation of polarization with frequency.
17. Write two applications of ferrites.
18. Discuss the principle of laser ablation technique in the synthesis of nanoparticles.
19. What are direct and indirect gap semiconductors?
20. Ordinary light does not show non-linear effects when passed through crystals. Why?

**PART C (5 x 14 = 20 Marks)**

21. (a) Using classical free electron theory derive the expression for electrical conductivity & thermal conductivity in metal and by using it prove Wiedemann-Franz law.  
(OR)
  - (b) (i) Explain the properties of Superconductors. (7)
  - (ii) Describe in detail Type I and Type II Superconductors. (7)
22. (a) (i) Describe the technique of Czochralski crystal growth. (10)  
(ii) Explain the Molecular Beam epitaxy technique (MBE). (4)  
(OR)
  - (b) Explain the various steps involved in the fabrication of a monolithic Integrated circuit.
23. (a) Explain the domain theory of ferromagnetism and discuss the Hysteresis curve of a ferromagnetic material.  
(OR)
  - (b) Explain the different types of polarization and discuss the influence of temperature on these types.
24. (a) (i) Describe the preparation, properties and application of metallic glasses. (10)  
(ii) Discuss the applications of SMA Ni-Ti alloy. (4)  
(OR)
  - (b) (i) Explain the different techniques used in the synthesis of Nano particles. (10)
  - (ii) Discuss the applications of carbon nano tubes. (4)
25. (a) (i) Explain briefly about "Excitons". (4)  
(ii) Explain colour centre & its types. (10)  
(OR)
  - (b) Describe the construction and working of Twisted nematic Liquid crystal display.

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