Reg. No. :

Question Paper Code: 51204

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Second Semester

Electrical and Electronics Engineering

15UPH204 – SOLID STATE PHYSICS

(Common to Electronics and Instrumentation Engineering)

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Electrical conductivity of insulators is the range

(a) $10^{-10} \Omega^{-1} \text{mm}^{-1}$	(b) $10^{-10} \Omega^{-1} \text{mm}^{-1}$
(c) $10^{-10} \Omega^{-1} \text{mm}^{-1}$	(d) $10^{-8} \Omega^{-1} \text{mm}^{-1}$

2. Lorentz number value is

(a) $1.2 \times 10^{-8} W \Omega K^{-2}$	(b) $1.12 \times 10^{-8} W \Omega K^{-2}$
(c) $1.22 \times 10^{-8} W \Omega K^{-2}$	(d) $1.3 \times 10^{-8} W\Omega K^{-2}$

3. Energy band gap size for semiconductors is in the range ______ eV.

(a) 1-2 (b) 2-3 (c) 3-4 (d) >4

4. Fermi energy level for intrinsic semiconductors lies

(a) At middle of the band gap	(b) Close to conduction band
(c) Close to valence band	(d) none of these

- 5. Permanent magnets are made of _____ materials.
 - (a) soft magnetic (b) hard magnetic
 - (c) semi conductors (d) super conductors

6. The property due to which the resistance of some metal or compound vanishes under certain conditions is

	(a) Semi conductivity(c) Curie temperature		(b) Super conductivity(d) Magnetostriction	
7.	Dielectric constant of	vacuum is		
	(a) infinity	(b) 100	(c) 1	(d) 0
8.	Frequency range of po	larization is		
	(a) 10 ¹⁵ Hz	(b) 10 ¹³ Hz	(c) 10^{12} Hz	(d) 10 ¹⁰ Hz
9.	10 nm = m.			
	(a) 10 ⁻⁸	(b) 10 ⁻⁷	(c) 10 ⁻⁹	(d) 10^{-10}
10.	Fullerene or bucky bal	l is made up of	carbon atoms.	
	(a) 100	(b) 20	(c) 75	(d) 60

PART - B (5 x 2 = 10 Marks)

- 11. What are the successes of classical free electron theory?
- 12. Distinguish between n-type and p-type of semiconductors.
- 13. The transition temperature for superconducting material is 3.7 k at zero magnetic fields and critical field is 0.0306 A/m at 0k.Calculate the critical field at 2k.
- 14. What is ionic polarization? Write an expression for ionic polarizability.
- 15. List the synthesis methods of nano materials.

PART - C (
$$5 \times 16 = 80 \text{ Marks}$$
)

1. 16. (a) Derive an expression for electrical conductivity and thermal conductivity of metals. (16)

Or

- (b) (i) Derive an expression for the density of states. (10)
 - (ii) A conducting rod contains 8.5 x 10^{28} electrons per cubic meter. Calculate the electrical conductivity and mobility of electrons, if the collision time for scattering is 2 x 10^{-14} sec. (6)

17. (a) Derive an expression for the concentration of electrons in the conduction band of an intrinsic semiconductor. (16)

Or

	(b)	Using Hall Effect, how will you determine the electrical conductivity of a ex	trinsic
		semiconductor?	(16)
18.	(a)	(i) Explain the domain theory of Ferro magnetism.	(8)
		(ii) Describe the properties and applications of ferrites.	(8)
Or			
	(b)	(i) Describe type I and type II superconductors.	(10)
		(ii) Discuss the functions of SQUID.	(6)
19. (a) Derive an expression for the electronic and ionic polarization of dielectric material.			
			(16)
Or			

- (b) Derive an expression for the internal field in a dielectric material and deduce the Clausius-Mosotti relation. (16)
- 20. (a) Describe the method of producing nano materials using Chemical vapour deposition method. (16)

Or

(b) (i)	Distinguish between the	e top-down and bottom-up approach.	(8)
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(ii) Write short notes on properties of nano particles. (8)

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