A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 52005

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2024

Second Semester

Computer Science Engineering

15UPH205 - SEMICONDUCTOR PHYSICS AND OPTO ELECTRONICS

(Common to ECE and IT)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The resistance of the most of the conducting materials __ with increase in temperature CO1-R

   (a) Increases (b) Decreases

   (c) Remain same (d) first decreases and then increases

2. The value of F (E) lies between __ CO1-R

   (a) 0 and1 (b) 1 and 2 (c) -1 and 1 (d) 0 and -1

3. Silicon doped with phosphorous is a __ CO2-R

   (a) intrinsic semiconductor (b) extrinsic semiconductor

   (c) p-type semiconductor (d)n-type semiconductor

4. Cobalt is the example for __ material CO2-R

   (a) ferromagnetic (b) ferroelectric (c) dielectric (d) paramagnetic

5. Dielectric materials have __ CO3-R

   (a) free charges (b) no free charge (c) free electrons (d) none of these

6. A superconductor repels magnetic flux lines, this phenomenon is called CO3-R

   (a) Isotope effect (b) Hall effect (c) Josephson effect (d) Meissner effect

7. Demodulation is done in__ CO4-R

(a) Receiving antenna (b) Transmitter

(c) Radio receiver (d) Transmitting antenna

8. Optical switching can be classified into _____ categories. CO4-R

(a) Two (b)Three (c) Four (d) One

9. For long distance communication __ are more suitable CO5-R

(a) graded index fibers (b) single mode step index fibers

(c) step index fibers (d) silica fibers

10. Which of the following loss occurs inside the fibre? CO5-R

(a) Radiative loss (b) Scattering (c) Absorption (d) Attenuation

PART – B (5 x 2= 10Marks)

11. Define drift velocity. CO1-R

12. List types of semiconductors with example. CO2-R

13. Mention any two properties of superconductors. CO3-R

14. What is meant by modulation and demodulation in optical communication system? CO4-R

15. Name the types of optical fibers based on number of modes. CO5-R

PART – C (5 x 16= 80Marks)

16. (a) (i) Apply the classical free electron theory to derive the expression for electrical conductivity and thermal conductivity of metals. CO1-App (12)

(ii) Calculate the probability function F (E) of an electron for following cases. CO1-App (4)

(a) Probability of occupation of electron for E<EF at T=0K

(b) Probability of occupation of electron for E>EF at T=0K

Or

(b) (i) Calculate the number of available electron states per unit volume in an energy interval dE using quantum free electron theory. CO1-App (12)

(ii) Calculate carrier concentration in metals using above expression. CO1-App (4)

17.	(a)	(i) Demonstrate Hall effect experiment to determine the type of semiconductor.	CO2-U	(12)
		(ii) Classify magnetic materials based on their properties and spin.	CO2-U	(4)
		Or		
	(b)	(i) Explain the formation of domain structure and various energies involved in the process of domain growth with diagram.	CO2-U	(10)
		(ii) Differentiate soft magnetic materials from hard magnetic materials	CO2-U	(6)
18.	(a)	(i) Obtain Clausius-Mossotti equation which gives the relation between the macroscopic dielectric constant and the microscopic polarizability of a substance	CO3-Ana	(12)
		(ii) Compare and contrast the different types of polarization mechanisms involved in a dielectric material.	CO3-Ana	(4)
		Or		
	(b)	(i) Explain the characteristics of type-I and type-II superconductors with examples.	CO3-Ana	(10)
		(ii) Select and explain the device which is used to measure earth quakes and magnetic signal from the brain, heart etc.	CO3-Ana	(6)
19.	(a)	(i) Express the concepts of the stark effect and the Franz Keldysh effect	CO4-U	(10)
		(ii) Give short notes on pulse code modulation.	CO4-U	(6)
		Or		
	(b)	(i) What is meant by optical switching? Explain the working of self electro optic effect device (SEED).	CO4-U	(12)
		(ii) List the applications of bipolar controller.	CO4-U	(4)
20.	(a)	(i) Derive the expression for critical angle, acceptance angle and numerical aperture of an optical fiber.	CO5-U	(12)
		(ii) Discuss the types of optical fiber based on the number of modes of propagation of light signal.	CO5-U	(4)
		Or		
	(b)	(i) Discuss the optical fibre communication system with neat block diagram.	CO5-U	(10)
		(ii) Describe principle, construction and working of temperature sensor.	CO5-U	(6)

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