A   Reg. No. :

Question Paper Code: 52005

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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   CO1-R
   in temperature

   (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)

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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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