Reg. No. :

Question Paper Code: 50025

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Second Semester

Computer Science Engineering

15UPH205 - SEMICONDUCTOR PHYSICS AND OPTO ELECTRONICS

(Common to ECE and IT branches)

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The electrical conductivity of a conductor may be increased by

   (a) increasing its temperature   (b) decreasing its temperature
   (c) increasing its vibrations   (d) decreasing its vibrations

2. On increasing the impurity concentration in the metal the residual part of the resistivity

   (a) decreases   (b) remains constant
   (c) increases   (d) may increase or decrease

3. Which of the following is not a semiconductor?

   (a) Selenium   (b) Silica
   (c) Gallium arsenide   (d) Carborundum

4. Above the curie temperature, a magnetic material becomes

   (a) ferromagnetic   (b) paramagnetic
   (c) diamagnetic   (d) none of these

5. Dielectric materials are used primarily for

   (a) insulation   (b) charge storage
   (c) reducing dielectric loss   (d) none of these

6. A superconducting material on being subjected to critical field changes to

    (a) normal state   (b) critical conductivity

    (c) super conductivity   (d) remains uninfluenced

7. The pulse code modulation is commonly implemented on a single integrated circuit generally referred to as

    (a) analog-to-digital converter   (b) digital-to-analog converter

    (c) signal processor   (d) none of these

8. The working principle of optical switching is

    (a) diffraction   (b) interference of light

    (c) polarization   (d) none of these

9. The principle behind the fibre optics is

    (a) refraction   (b) total internal reflection

    (c) interference   (d) diffraction

10. Among the fibres, which will have the lowest dispersion and lowest loss?

    (a) step index fibres   (b) graded index fibres

    (c) multimode fibres   (d) single mode step index fibres

PART - B (5 x 2 = 10 Marks)

11. What is meant by lorentz number?

12. Define the operating temperature of a semiconductor.

13. What is SQUID?

14. Define modulation.

15. What is acceptance angle of the fibre?

PART - C (5 x 16 = 80 Marks)

16. (a) Using the classical free electron theory, derive the mathematical expressions for the electrical and thermal conductivity of metals and hence deduce Wiedemann-Franz law.   (16)

Or

(b) Derive an expression for the density of energy states and carrier concentration in a solid metal.   (16)

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17. (a) (i) What is Hall effect? Mention its importance. (6)

   (ii) Derive an expression for conductivity of a semiconductor. (10)

Or

   (b) (i) Distinguish between dia, para and ferro magnetic materials. (8)

   (ii) Explain hysteresis effect on the basis of domains. (8)

18. (a) (i) Explain ionic polarizability and derive an expression for it. (8)

   (ii) Explain the electrical properties of insulating materials. (8)

Or

   (b) (i) Explain in brief the types of superconductors. (10)

   (ii) Mention the properties of high temperature superconductors. (6)

19. (a) (i) What is the difference between the stark effect and the Franz-Keldysh effect. (6)

   (ii) Explain pulse code modulation with a block diagram. (10)

Or

   (b) (i) Describe the working of self electronic optic effect device with a neat diagram. (10)

   (ii) Explain bipolar controller. (6)

20. (a) (i) Explain fusion splicing with a neat sketch. (6)

   (ii) Describe the principle, construction and working of a phase modulated sensor. (10)

Or

   (b) (i) Explain with neat block diagram the fibre optic communication system. (10)

   (ii) Describe various mechanisms of attenuation in optical fibres. (6)

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