Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 18

B.Tech. (ECE) (2018 & Onwards) (Sem.–1,2)

SEMI-CONDUCTOR AND OPTOELECTRONICS PHYSICS

Subject Code : BTPH-105-18

M.Code : 75363

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

Write briefly :

Q1. What is the difference between classical and quantum theory of free electrons?

Q2. What is Fermi energy? Write down its relation with concentration of electrons in metals.

Q3. State Bloch's theorem for a periodic system.

Q4. Explain why the conductivity of a pure semiconductor increases with temperature while that of a metal decreases.

Q5. Explain Fermi-Dirac distribution function. Plot this function for various temperatures including 0 K.

Q6. What is Schottky diode?

Q7. Explain the term absorption and spontaneous emission of radiation.

Q8. What property of materials can be measured with Hot-point probe?

Q9. What is the avalanche photodetector?

Q10. What physical parameters can be known from I-V characteristics of diode?

SECTION-B

Q11. Solve the Schrodinger wave equation for particle in a box and obtain its energy levels. Show that the eigenvalues of energy are discrete. [8]

Q12. Discuss the motion of electrons in a region of periodic potential and how it lead to explain the occurrence of allowed and disallowed energy regions. [8]

Q13. Obtain an expression for the carrier density of an intrinsic semiconductor. Explain how the resistivity of an intrinsic semiconductor varies with temperature. [5+3=8]

Q14. (a) What do you mean by carrier generation and recombination process? [4]

(b) Explain the terms: barrier energy, barrier potential and depletion region, as applied to a p-n junction. [4]

SECTION-C

Q15. What is a semiconductor laser? Discuss in detail the lasing action in semiconductor laser with necessary diagram. [2+6=8]

Q16. What are light emitting diodes? Discuss the structure and characteristics of LEDs. [2+6=8]

Q17. Discuss in detail the working principles of p-i-n photodiode and its characteristics. [8]

Q18. Explain in detail about the measurement of carrier density, resistivity and hall mobility by four probe method. [8]

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.