



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 3B2AF

B.Tech II Semester Regular/Supplementary Examinations, October 2022

APPLIED PHYSICS

(Common to EEE, CSE, CSE(AI&ML), CSE(DS) & IT)

Maximum Marks: 70

Date: 13.10.2022

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

(10x2M=20 Marks)

All the following questions carry equal marks

- 1 What do you understand about the forbidden gap of a semiconductor?
- 2 What is meant by Brillouin zone?
- 3 Find the diffusion co-efficient of electrons in silicon at 300 K, if μ_e is $0.01 \text{ m}^2/\text{Vs}$.
- 4 Define the diffusion concept in semiconductors.
- 5 Write the difference between homo and hetero junctions.
- 6 Mention the various types of Hetro structures.
- 7 Write any two applications of Light Emitting Diode (LED).
- 8 Define the Injection Electro luminescence.
- 9 What is reverse saturation current in a diode?
- 10 What is meant by the photo voltaic effect?

Part-B

(5X10M=50Marks)

Answer All the following questions.

- 11 a) Discuss the Classical Free electron theory with its merits and demerits. 5 Marks
b) Describe how the materials are classified into conductors, semiconductors and insulators with the help of energy band diagrams. 5 Marks
- OR
- 12 a) The density of silver is $10.5 \times 10^3 \text{ kg/m}^3$, the atomic weight of silver is 107.9. Assuming that each silver atom provides one conduction electron. Calculate the density of free electrons. (The conductivity of silver at 20°C is $6.8 \times 10^7 \text{ ohm}^{-1}\text{m}^{-1}$) 3 Marks
b) Explain the Kronig-Penny model. 7 Marks
- 13 a) Discuss how the Fermi level dependence on carrier concentration and temperature. 5 Marks
b) Define the Hall Effect and derive the relation between the Hall co-efficient (R_H) and the Hall voltage (V_H). 5 Marks

OR

- 14 a) Write a detailed note on intrinsic and extrinsic semiconductors. 5 Marks
b) What is meant by a PN-junction and explain the formation of a PN-junction. 5 Marks
- 15 a) What kind of semiconducting materials are used in opto-electronic devices? Explain. 5 Marks
b) Discuss in detail about the optical loss and gain. 5 Marks
- OR
- 16 a) Explain about the band gap modification and write its advantages. 5 Marks
b) Discuss with suitable diagrams the stimulated absorption, spontaneous emission and stimulated emission of radiation. 5 Marks
- 17 a) Differentiate the direct and indirect band gap semiconductors with proper examples. 5 Marks
b) Write a note on Quantum-well laser. 5 Marks
- OR
- 18 a) With a neat diagram explain the construction and working of a LED. 5 Marks
b) Describe the laser diode with the necessary diagrams and write any two applications of it. 5 Marks
- 19 a) Differentiate between the photo detectors and the photo conductors. 3 Marks
b) Explain the construction and I-V characteristics of a solar cell. 7 Marks
- OR
- 20 a) Discuss the various types of semiconductor photo detectors with examples. 5 Marks
b) Describe with suitable diagram the working of a PIN diode and also mention its uses. 5 Marks