R20 Regulation *Subject code:* **3B2AF**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, September 2021

APPLIED PHYSICS

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

Maximum Marks: 70 Date:11.09.2021 ***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

All the following questions carry equal marks **(10x2M=20 Marks)**

1 What is meant by a Brillouin zone?
2 Define the Fermi energy and mention its importance.
3 Explain the terms carrier generation and recombination.
4 The intrinsic carrier density is $1.5x10^{16}/m^3$. If the mobility of electron and hole is 0.13 and 0.05 $m^2V^{-1}s^{-1}$. Calculate the conductivity.
5 Differentiate the homo and hetero junction?
6 Write about optical loss and gain.
7 Define the energy band gap of a semiconductor.
8 Explain the quantum dot.
9 Define the space charge region in a p-n junction.
10 Specify the difference between the photo conductors and photo detectors.

Part-B

Answer All the following questions. **(5X10M=50Marks)**

11 a) Write the differences between the classical and quantum free electron theory. 5M
b) Explain the metals, semiconductors and insulators on the basis of band theory of solids. 5M

OR

12 a) Derive an expression for density of states of the charge particles. 5M
b) Discuss the silent features of Kronig-Penny model of a crystal. 5M
13 a) Distinguish between intrinsic and extrinsic semiconductors with suitable examples. 5M
b) Explain the Hall Effect and write its applications. 5M

OR

14 a) Write a note on Fermi level, how it depends on temperature and doping concentration. 5M
b) Describe the drift and diffusion concepts in a semiconductor. 5M
15 a) Write a detail note on the band gap modification and its importance in semiconductors. 5M
b) What is Photovoltaic Effect? Explain in detail. 5M

OR

16 a) With neat figures explain the absorption, spontaneous and stimulate emissions. 5M

	b) Define and explain the Fermi's golden rule.	5M
17	a) Differentiate the direct and indirect band gap semiconductors.	5M
	b) Describe the construction and working of a laser diode.	5M
	OR	
18	a) What is the basic principle of a LED and discuss its important applications?	5M
	b) Calculate the wavelength of the emitted light for the gallium arsenide phosphide having energy band gap of 2.2 eV.	5M
19	a) Explain the formation of a PN-junction diode.	5M
	b) Draw and explain the V-I characteristics of a solar cell and write its applications.	5M
	OR	
20	a) With a neat sketch explain the construction and working of a PIN diode.	5M
	b) What is dark current? How does this depend on the solar cell material characteristics?	5M