Code No: 181AA **R22**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech I Year I Semester Examinations, September - 2023

APPLIED PHYSICS

(Common to CE, ME, ECE, EIE, AE, BT, MIE, PCE, CSE(AI&ML), CSE(IOT), AI&DS, AI&ML)

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

Note: This question paper contains two parts A and B.
i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

1.a)	What is the difference between classical and quantum mechanics?	[1]
b)	If the momentum of a particle is increased to four times, then find the change in de-Broglie wavelength?	[1]
c)	What will be the temperature co-efficient of an intrinsic semiconductor?	[1]
d)	How the bulk resistance of the semiconductor changes as the doping increases?	[1]
e)	Give two examples of paramagnetic material.	[1]
f)	What happens to a ferromagnetic material heated above curie temperature?	[1]
g)	What is Nanoscale?	[1]
h)	What is the procedure in the top-down synthesis of nanomaterials.	[1]
i)	Define numerical aperture.	[1]
j)	Can we obtain light amplification in the absence of stimulated emission?	[1]

PART - B

(50 Marks)

2.	Derive the expression for time-independent Schrodinger wave equation.	[10]

OR

3.a)	What are the assumptions in Drude-Lorentz theory?	
b)	Explain Davisson-Germer experiment in detail? How does it explain the wave nature of electrons?	[4+6]
4.	Explain with suitable diagrams the conduction band, valence band and the forbidden band. Discuss the contribution of electrons and holes to electrical conduction?	[10]

OR

5.a)	How n-type and p-type semiconductors are produced?	
b)	Distinguish between Zener and avalanche breakdown?	[5+5]

6.a) Define the following terms (i) Dielectric Polarization, (ii) Polarisability, (iii) Dielectric Constant, (iv) Spontaneous polarization, (v) Electric susceptibility.

b) What is a bubble memory? What type of materials are used in it? [5+5]

OR

7.a) Explain how the dielectric constant of a ferroelectric material varies with temperature. Name two ferroelectric materials?

b) What are the applications of ferroelectric materials? [7+3]

8.a) List the similarities and differences between SEM and TEM.

b) Explain Quantum confinement of nanoparticles. [8+2]

OR

9.a) Explain in detail PVD and CVD methods of nano synthesis of films and relative merits.

b) Write a note on surface to volume ratio. [6+4]

10.a) Differentiate between three level and four level lasers by giving suitable examples.

b) Discuss merits and demerits of single mode optical fibers. [6+4]

OR

11.a) Specify three types of possible energy transitions between two atomic energy levels and also derive conditions for Einstein's coefficients.

b) Light gathering capacity of an optical fibre is 0.479. If relative core cladding index difference is 0.005, calculate the refractive index of cladding if the outside medium is air. [8+2]

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