

R22

Code No: 181AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech I Year I Semester Examinations, January/February - 2025

APPLIED PHYSICS

(Common to CE, ME, ECE, 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) If the energy of a particle is reduced to half then find the percentage increase in the de-Broglie wavelength is about. [1]
- b) The total probability of finding material particle in given space must have what value for wave function to be normalized? [1]
- c) Write one important application of BJT. [1]
- d) Give one example of each type of intrinsic and extrinsic semiconductor. [1]
- e) What is the function of ferroelectric material? [1]
- f) What is the use of Bubble memory devices? [1]
- g) What is critical length of nano material? [1]
- h) What are size dependent properties of solid? [1]
- i) Give one example of molecular laser. [1]
- j) What is the impact of loss in optical fiber? [1]

PART - B

(50 Marks)

2. Discuss Kronig-Penny model. Using this model show that the energy spectrum of electron consists of a number of allowed energy bands separated by forbidden regions. [10]

OR

- 3.a) Analyze the observations of Black body radiations and how does classical theory fail to explain it?
- b) How is the Plank's radiation law established on the observations of Black body radiations? [5+5]

- 4.a) What do you mean by mobility of semiconductor? Derive an expression for the mobility.
- b) Write construction, principle of operation, characteristics and application of P-N junction diode. [5+5]

OR

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- 5.a) Analyze the structure, materials, working principle and characteristics of Solar cell.
b) Describe the structure, materials, working principle and characteristics of Avalanche Photo Diode. [5+5]

QA QA QA QA QA QA QA QA QA

- 6.a) Distinguish between solid and liquid electrolytes.
b) Analyze the construction and working principle of solid fuel cell. [5+5]

OR

- 7.a) Describe the property of Piezo electric material. Using it how a crystal oscillators are made.
b) Analyze the construction and working of Liquid Crystal Display. [5+5]

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- 8.a) Write short notes on:
i) Ball milling ii) Sol-gel
b) Analyze the X-ray diffraction technique for the characterisation of nanoparticles. [5+5]

OR

- 9.a) How does the scanning tunnelling microscopy work?
b) How does electron microscopy technique used for characterisation of nano-particles? [5+5]

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- 10.a) Explain the following terms:
(i) Spontaneous emission (ii) Stimulated emission.
b) How Optical fibers are used in optical communication? Give proper working methodology of fiber optic communication. [5+5]

OR

- 11.a) Estimate the numerical aperture of Optical fiber.
b) Explain the principle, construction and working Nd:YAG laser. [5+5]

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