

**R18**

Code No:151AE

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD**

**B.Tech I Year I Semester Examinations, December - 2018**

**APPLIED PHYSICS**  
(Common to ECE, EIE)

**Time: 3 hours**

**Max. Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) State the principle of uncertainty. [2]  
b) What is reverse saturation current? [2]  
c) Write any two characteristics of PIN photodiode. [2]  
d) How laser beam achieves coherence? [2]  
e) Why susceptibility of diamagnetic materials is negative. [2]  
f) What is a blackbody? State Planck's hypothesis. [3]  
g) Explain Fermi level dependence on carrier concentration. [3]  
h) A light emitting diode is made of GaAsP having a band gap of 1.9 eV. Determine the wavelength of the radiation emitted. [3]  
i) Differentiate graded index fibres from step index fibres. [3]  
j) Write a short note on piezoelectric materials. [3]

**PART - B**

**(50 Marks)**

- 2.a) Derive one-dimensional time-independent Schrodinger wave equation for an electron.  
b) Calculate the velocity and kinetic energy of an electron of wavelength 1.66 Å. [7+3]  
**OR**  
3.a) Explain Compton effect and derive expression for Compton shift.  
b) X-ray photon wavelength 0.3 Å is scattered through an angle 45° by a loosely bound electron. Find the wavelength of scattered photon. [7+3]  
4.a) With the help of schematic diagram, explain construction and principle of operation of bipolar junction transistor.  
b) Discuss any three applications of Hall effect. [7+3]  
**OR**  
5.a) With neat plots describe V-I characteristics of a Zener diode in both biasing conditions.  
b) Explain the formation of potential barrier across the p-n junction. [7+3]

6.a) What are photodiodes? Explain working principle and structure of Avalanche photodiode.

b) Explain recombination mechanism in semiconductors. [7+3]

OR

7.a) Explain with neat diagram, the construction and working of solar cell. State few disadvantages of solar cell.

b) With relevant plots, explain V-I characteristics of a solar cell. [7+3]

8.a) Derive the relationship between Einstein's coefficients and explain their physical significance.

b) Explain the applications of lasers in medicine. [7+3]

OR

9.a) Derive an expression for acceptance angle for an optical fibre. How is it related to numerical aperture?

b) Find the numerical aperture and acceptance angle of a fibre of core index 1.4 and fractional refractive indices 0.002. [7+3]

10.a) Explain the term internal field. Derive an expression for internal field in the case of one dimensional array of atoms in dielectric solids.

b) Deduce Clausius-Mossotti relation for dielectrics. [7+3]

OR

11.a) Classify the magnetic materials based on atomic point of view.

b) State and explain Ampere's circuital law. [7+3]