

**I B. Tech I Semester Regular Examinations, July/August- 2021****APPLIED PHYSICS**

(Common to CSE, CSE-CS&amp;T, IT , CSE-CS, CSE-IOT&amp;CS incl BCT, CSE-CS &amp; BS, CSE-IOT)

Time: 3 hours

Max. Marks: 70

**Answer any five Questions one Question from Each Unit****All Questions Carry Equal Marks**

1. a) Describe and explain the formation of Newton's rings in reflected light. Deduce (10M)  
expressions for getting bright and dark rings in terms of the diameters.
- b) When Newton's rings are observed in the reflected light of wavelength  $5.9 \times 10^{-5}$  cm, the diameter of the 10<sup>th</sup> dark ring is found to be 0.50cm. Find the radius of curvature of the lens and thickness of the air film? (4M)

**Or**

2. a) With the help of neat diagrams, explain how Nicol's prism is used to produce and (10M)  
analyze plane polarized light.
- b) Define a quarter-wave plate and write the expression for its thickness. (4M)
3. a) Discuss various pumping mechanisms. Explain the construction and working of a (10M)  
Ruby Laser with a neat energy level diagram.
- b) What are the differences between the terms spontaneous and stimulated (4M)  
emission?

**Or**

4. a) Discuss the propagation of an electromagnetic wave through optical fibres. (10M)
- b) Explain the differences between single and multimode optical fibres. (4M)
5. a) Obtain Schrodinger time-independent and time-dependent wave equations. (10M)
- b) An electron has a velocity of 600 m/s with an accuracy of 0.005%. Calculate the (4M)  
uncertainty with which we can locate the position of the electron.

**Or**

6. a) Discuss quantum free electron theory. Obtain an expression for electrical (10M)  
conductivity by considering the quantum effects.
- b) Write the conclusions given by the Kronig-Penny model. (4M)
7. a) Explain the diamagnetism, paramagnetism, and ferromagnetism on the basis of (10M)  
magnetic dipoles of the atom.
- b) What are Eddy Currents? Explain how they are produced and how they can be (4M)  
minimized.

**Or**

8. a) Explain the different types of polarization mechanism involved in a dielectric (10M)  
material. Obtain the expression for ionic polarizability.
- b) If an ionic crystal is subjected to an electric field of  $1000 \text{ Vm}^{-1}$  and the resulting (4M)  
polarization  $4.3 \times 10^{-8} \text{ cm}^2$ . Calculate the relative permittivity of NaCl.

9. a) Explain how Fermi energy dependent on temperature and carrier concentration in the case of intrinsic as well as extrinsic semiconductors. (10M)
- b) For an intrinsic Semiconductor with a band gap of 0.7 eV, determine the position of  $E_F$  at  $T = 300$  K if the effective mass of the hole is equal to six times of effective mass of the electron. (4M)
- Or**
10. a) Discuss the formation of Cooper pair and energy gap in superconductors on the basis of the BCS theory. (10M)
- b) Write down the applications of superconductors. (4M)