

I B. Tech I Semester Supplementary Examinations, July/August - 2021**ENGINEERING PHYSICS**

(Com. to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is Compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Explain the cosine law in interference. (4M)
- b) How light waves are guided in an optical fibre? (3M)
- c) Explain the effect of magnetic field on superconductors. (3M)
- d) Express Maxwell's equations in differential form. (4M)
- e) Explain the drift velocity and relaxation time of free electrons in metals. (4M)
- f) Write short note on drift and diffusion currents. (4M)

PART -B

2. a) Explain the theory of plane transmission grating and derive equations for maxima and minima. (8M)
- b) A plane grating having 10520 lines/cm is illuminated with light of wavelength 5×10^{-5} cm at normal incidence. How many orders are visible in the grating spectra? (4M)
- c) Explain principle, working and construction of a solar cell with a neat diagram. (4M)
3. a) Deduce the packing fractions of SC and BCC structures. (8M)
- b) Determine the lattice constant for a FCC crystal having an atomic radius of 0.1476nm. (4M)
- c) Explain concept of the effective mass of an electron. (4M)
4. a) Explain electronic polarization and show that electronic polarizability is directly proportional to the volume of the atom. (8M)
- b) Calculate the electronic polarizability of argon atom. Given that $\epsilon_r=1.0024$ at NTP and $N=2.7 \times 10^{25}$ atoms/m³. (4M)
- c) State and explain Stoke's theorem. (4M)
5. a) State and explain Sabine's formula for reverberation time of a hall. Derive Sabine's formula for reverberation time. (8M)
- b) A hall has a volume of 2265m³ and its total absorption is equivalent to 92.9m² of open window. What will be the effect on reverberation time if audience fill the hall and thereby increase the absorption by another 92.9m²? (4M)
- c) Explain dependence of ferromagnetic material susceptibility on temperature. (4M)

6. a) Deduce a mathematical expression for electrical conductivity on the basis of classical free electron theory. (8M)
- b) Calculate the drift velocity of conduction electrons in copper at a temperature of 300K when a copper wire of length 2m and resistance 0.02Ω carries a current of 15A. Given that mobility of the electrons is $4.3 \times 10^{-3} \text{ m}^2/\text{Vs}$. (4M)
- c) How can X-rays be made to diffract? State and explain Bragg's law. (4M)
7. a) What is Hall Effect? Deduce an expression for Hall coefficient. (8M)
- b) An n-type semiconducting specimen has a Hall coefficient of $3.66 \times 10^{-11} \text{ m}^3/\text{As}$. The conductivity of the specimen is found to be $112 \times 10^7 \Omega^{-1}\text{m}^{-1}$. Calculate the charge carrier density and the electron mobility at room temperature. (4M)
- c) Describe the phenomenon of polarization. (4M)