Code No: R161104 **R16** SET - 1

I B. Tech I Semester Supplementary Examinations, January - 2020
APPLIED PHYSICS
(Com. to ECE, CSE, IT, EIE, E Com 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 **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) What is an advantage of interferometer? (2M)
   b) Define resolving power of a microscope. (2M)
   c) What are the basic components of a laser system? (2M)
   d) Define scalar field with example. (2M)
   e) Show that the de Broglie wavelength for an electron is found to be $\frac{12.26}{\sqrt{V}}$ Å (2M)
   f) Write any two drawbacks of classical free electron theory. (2M)
   g) Express conductivity of a semiconductor in terms of mobilities of charge carriers. (2M)

PART -B

2. a) Explain the phenomena of interference in parallel thin film due to reflected light and discuss the condition of maximum and minimum intensity of the film. (10M)
   b) Blue light of wavelength 480 nanometers is most strongly reflected off a thin film of oil on a glass slide when viewed near normal incidence. Assuming that the index of refraction of the oil is 1.2 and that of the glass is 1.6, what is the minimum thickness of the oil film. (4M)

3. a) Describe Fraunhofer diffraction at a circular aperture with relevant theory. (10M)
   b) The Fraunhofer diffraction pattern of a circular aperture of radius 0.5 mm is observed on the focal plane of a convex lens of focal length 20 cm. Calculate the radii of the first dark rings. Assume λ=5.5 x 10^{-5} cm. (4M)

4. a) With the help of suitable diagram, explain the construction and working of He – Ne laser. (10M)
   b) "Stimulated emission is must for laser transitions". Comment and justify your answer. (4M)

5. a) Write the Maxwell electromagnetic wave equations in differential and integral form. Prove that electromagnetic waves are transverse in nature. (10M)
   b) What do you understand by the gradient of a scalar field? Explain with one example. (4M)
~~~~~~

6. a) Obtain an expression for electrical conductivity on the basis of free electron theory. (10M)

   b) Using the Fermi function, evaluate the temperature at which there is 1% probability that an electron in a solid will have energy 0.5 eV above E_F of 5 eV. (4M)

7. a) What is Hall effect? Derive the expression for Hall coefficient. (10M)

   b) Find the Hall coefficient and electron mobility of Ge for a given sample (length 1 cm, breadth 5 mm, and thickness 1 mm). A current of 5 mA flows from a 1.35 V supply and develops a Hall voltage of 20 mV across the specimen in a magnetic field of 0.45 Wb/m^2. (4M)