Code No: R19BS1204 **R19** SET - 1

I B. Tech II Semester Supplementary Examinations, July/August - 2021
APPLIED PHYSICS
(Com. to EEE, ECE, CSE, EIE, IT)

Time: 3 hours Max. Marks: 75

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

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1. a) Define resolving power of a grating. Obtain an expression for resolving power in the case of plane transmission grating. (8M)

   b) A grating of width 2inch is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in second-order at a mean wavelength of 500nm. (3M)

   c) With necessary equations explain briefly the experimental procedure to determine the refractive index of a liquid. (4M)

Or

2. a) Obtain the conditions for maxima and minima in the case of diffraction at a single slit. (8M)

   b) Light of wavelength 698nm is incident on a narrow slit. The second dark fringe isformed at an angle of 2^0 from the central axis. What is the width of the slit? (3M)

   c) Distinguish between Fraunhofer and Fresnel diffraction. (4M)

3. a) Describe how the experiment conducted by G.P.Thomson confirms the existence of matter waves. (10M)

   b) Discuss the properties of matter waves. (5M)

Or

4. a) Explain how the idea of de-Broglie wavelength led to the conceptualization of the Heisenberg uncertainty principle. Explain the uncertainty principle with illustrations. (8M)

   b) Nucleons are confined to a nucleus of radius 5×10^{-15} m. Calculate the minimum uncertainty in the momentum of the nucleon. Also, calculate the minimum kinetic energy of the nucleon.
   Given that $m_p = 1.67 \times 10^{-27}$ kg and $h/2\pi = 1.05 \times 10^{-34}$ J-s. (7M)

5. a) What are the postulates of quantum free electron model? Using this theory derive an expression for electrical conductivity in metal. (10M)

   b) Explain any two drawbacks of the classical free electron theory. (5M)

Or
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6.	a)	Discuss the Kronig-Penny model for the motion of an electron in a periodic potential.	(8M)
	b)	Explain the concept of the effective mass of a hole.	(7M)
7.	a)	Derive an expression for Hall coefficient in semiconductors and explain any four of its applications.	(8M)
	b)	A semiconducting crystal with 12 mm long, 5 mm wide, and 1 mm thick has a magnetic density of 0.5 Wbm^{-2} applied from front to back perpendicular to the largest faces. When a current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be $37\mu V$. What is the Hall coefficient of this semiconductor?	(7M)
		Or	
8.	a)	Obtain an expression for the electrical conductivity of an intrinsic semiconductor.	(8M)
	b)	The electron and hole mobilities in a silicon sample are 0.135 and 0.048 m^2/V-s, respectively. Determine the conductivity of intrinsic Si at 300 K if the intrinsic carrier concentration is 1.5×10^{16} atoms/m^3. The sample is doped with 10^{23} phosphorous atoms/m^3. Determine the hole concentration and conductivity.	(7M)
9.	a)	Explain the electronic polarizability in atoms and obtain an expression for the electronic polarization in terms of the radius of the atom.	(8M)
	b)	Deduce Claussius-Mossotti relation.	(7M)
		Or	
10.	a)	Explain the origin of the magnetic moment in magnetic materials.	(8M)
	b)	Discuss applications of ferromagnetic materials.	(7M)