

VFSTR - VADLAMUDI	Regd. No.											
	Year	Semester			Branch			Section				
Staff Name: Dr. P. Srinivasa Rao	I	1			Non-Bio			26 to 46				
Faculty Dept : Physics	Course: EP			Code: 25PY101			Set-1					
Program Name: B. Tech.	Date: 31.10.25			Time: 9.00 to 10.30 AM			T1					

Time: 90 Minutes

Max. Marks: 30

Part-A

Answer all questions

- Write the expression for the de-Broglie wavelength in the following cases **(5M)**
 - A particle is moving with a kinetic energy 'E'
 - A particle is placed between the two electrodes having a potential difference of 'V' volts
 - A particle is at a thermal equilibrium of temperature 'T'
 - Calculate the de-Broglie's wavelength of an electron when a potential difference of 6400V is applied.
 - Calculate the de-Broglie's wavelength of an electron, when the electron is moving with a kinetic energy of 1eV.
- A copper wire has a length of 1m, 5cm width and thickness of 5cm carrying a current of 2A when a voltage of 0.1V is applied. The given density of copper =9000kg/m³ and the atomic weight of copper=64.54. and Avogadro's number= 6.023*10²⁶ /kmol. Calculate the following parameters

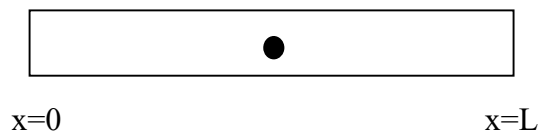
 - Charge carrier concentration(n)
 - Drift velocity(v_d)
 - Relaxation time(τ)
 - Mobility (μ)
 - Current density(J)

(5M)

Part-B

Answer all questions

- A free electron is moving inside a one-dimensional metal of length 'L' with zero potential energy as shown in below Figure. Assume that the potential energy at the ends of the metal is equal to infinity. Calculate its energy levels by applying the Schrodinger wave equation to it.



(5M)

- b) The energy of an electron in the ground state is 3eV, calculate the energy in the third excited state **(1M)**
- c) A photon of 10\AA is emitted when the electron is de-excited from third excited state to ground state. Calculate the length of the potential well. **(4M)**
4. a) A current carrying semiconductor is placed in a magnetic field 'B' having a thickness 't'. Obtain the mathematic expression to determine the given semiconductor is n-type or p-type. **(6M)**
- b) The Hall coefficient of a specimen is given by $0.075\text{m}^3/\text{C}$. Determine the following Parameters
- | | | |
|------------------------------|----------------------------|-------------|
| i) Type of the semiconductor | ii) Charge carrier density | (2M) |
|------------------------------|----------------------------|-------------|
- c) Calculate the electrical resistivity if the mobility = $0.15\text{m}^2/\text{Vs}$. **(2M)**