



*Arab Academy for Science & Technology & Maritime Transport
(AASTMT – Cairo Branch)*

College of Engineering & technology

Electronics & Communication Engineering Department

Course : Solid State Electronics

Course Code : EC210

Sheet #4

TextBook

'Principles of Electronic Materials and Devices', Third Edition, S.O. Kasap © McGraw-Hill, 2006

Constants:

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ Fm}^{-1}$$

$$\text{Charge of electron (q)} = 1.6 \times 10^{-19} \text{ C}$$

$$\text{Mass of electron (m}_e) = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Plank's Constant (h)} = 6.63 \times 10^{-34} \text{ Js}$$

Solve the following problems

[1] Use the De-Broglie relation to compute the wavelength of:

- a. A 46gram golf ball with a velocity of ms^{-1} .
- b. An electron with a velocity of 10^7ms^{-1} .

[2] Which of the following wave functions cannot be solutions of Schrodinger's eq. for values of x? Why not?

- a. $\psi(x) = A \tan(x)$
- b. $\psi(x) = e^{x^2}$
- c. $\psi(x) = e^{-x^2}$

[3] A particle has a wave function:

$$\psi(x) = A \sin(kx) \quad \text{for } 0 < x < L$$

- a. Find the probability density function.
- b. Find the value of A.
- c. Find the probability that the particle will be found in the region between $L/4$ to $L/2$.