Kafr Elshiekh University
Faculty of Engineering
Department of
Physical and Mathematical Engineering
First Year

Engineering physics (2)

13- 01- 2019
3 hours
90 Marks
Final exam: 2 pages

Answer the following questions:

Question(1) : (ILOs: a1) ***(15 Marks)***

(a) The radius of The sun is $6.96*10^8$m, and its total power output is $3.85*10^{26}$ W. Assuming the Sun's surface emits as a black body. Calculate its surface temperature , and find λ_{max} . ($\sigma = 5.670*10^{-8}$ W/m^2. K^4 , e=1)

(b) How does " Compton effect " explain the scattering of x-ray from electron?

Question(2) : (ILOs: c1) ***(15 Marks)***

(a) A free electron has a wave function $\psi(x) = Ae^{i(5*10^8 x)}$ Where x is in meters. Find Its de-Broblie wavelength and momentum. ($h=6.626*10^{-34}$ J.s)

(b) Prove the Time Independent Schrodenger Equation (TISE).

Question(3) : (ILOs: b1) ***(15 Marks)***

(a) For Copper at 300k calculate the probability that a state with an energy equal to 99% of the Fermi energy is occupied. (Cu: E_f=7.05 ev , $k_B=8.617*10^{-5}$ev.k^{-1})

(b) A superconducting tin has a critical temperature of 3.7k at zero magnetic field and a critical field of 0.0306 Tesla at 0k. Find the critical field at 2k.

(c) Briefly explain " The Tunneling through a potential energy barrier ".

Question(4) : (ILOs: a2) ***(15 Marks)***

(a) A plasma consists of an ionized gas of ions and electrons of equal number densities($n_i = n_e = n$) having charges of opposite sign +e, and masses m_i and m_e, respectively, where $m_i > m_e$. Relative displacement between the two species sets up a restoring electric field which returns the electrons to equilibrium, the ions being considered stationary. In the diagram, a plasma slab of thickness l has all its electrons displaced a distance x to give a restoring electric field E = nex/ε_0, where ε_0 is constant. Show that the restoring force per unit area on the electrons is xn^2e^2l/ε_0 and that they oscillate