إتصالات

Kafrelsheikh University
Faculty of Engineering
Dept. Electrical Engineering
Year: 3rd Year communication
Subject: Electronic Devices (ECE3107)

Semester: 1st Semester
Final Examination
Date: Dec. 24th, 2017
Time allowed: 3 hours.
Full Mark: 100

(a) This exam measures ILOs no.: a.5, a. 13,a14, b.5, b.6, b.8, c.5,d.1, d.7.
(b) No. of pages: 2 - No. of questions: 5
(c) Ask for clarification if any question statement is not clear to you.

Question # 1 (20 Marks...5 Marks for each part)

1. Explain the effect of cyclotron resonance frequency on observation the microwave energy.
2. Drive an expression that the Fermi level E_f is in the middle of the band gap in the intrinsic semiconductor.
3. Boron atoms are added to a S_i film resulting in an impurity density of 4×10^{16} cm^{-3}.

(a) What is the conductivity type of this film?
(b) What are the equilibrium electron and hole densities at 300 K?
(c) The mobile carrier concentration increase at high temperatures, explain?
(d) Where is the Fermi level located if T = 600 K?

4. Show that the probability of an energy state being occupied ΔE above the Fermi level is the same as the probability of a state being empty ΔE below the Fermi level.
$f(E_F + \Delta E) = 1 - f(E_F - \Delta E)$.

Question # 2 (20 Marks...5 Marks for each part)

1. How can be distinguishes between N-type and P-type, then explain thermoelectric generator.
2. Identify the Drift Current, and then drive a relation between it and the conductivity.
3. what mean by :
   a. Charge Neutrality
   b. *Rate of recombination*

4. (a) A silicon sample maintained at $T = 300$ K is uniformly doped with $N_d = 10^{16}$cm^{-3} donors. Calculate the resistivity of the sample.
(b) The silicon sample of part (a) is "compensated" by adding $N_a = 10^{16}$cm^{-3} acceptors. Calculate the resistivity of the compensated sample.
(c) Compute the resistivity of intrinsic ($N_a = 0$, $N_d = 0$) silicon at $T = 300$ K. Compare it with the result of part (b) and comment.

Question # 3 (20 Marks...5 Marks for each part)

1. Drive an expression of the field potential in the depletion layer, sketch the depletion layer model.
2. Drive an expression for the current transfer from the silicon to metal due to thermionic emission theory in all conditions.
3. Identify the following:

- Space-Charge Region (SCR) current
- Fermi Level Pinning

With my best wishes
Dr. noha abd al salam al shalaby and committee of correctors and testers

Question (3): **(20 Marks)**

a) ***What*** do you understand by generalized circuit constants of a transmission line? ***What*** is their importance? **(5 Marks)**

b) ***Why*** transmission lines are 3 phase 3 wire circuits while distribution lines are 3 phase 4 wire circuits? **(5 Marks)**

c) A 3-phase load of 2000 kVA, 0.8 p.f. is supplied at 6.6 kV, 50Hz by means of a 33kV, transmission line 20 km long and 33/6.6 kV step-down transformer. The resistance and reactance of each conductor are 0.4 Ω and 0.5 Ω per km respectively. The resistance and reactance of transformer primary are 7.5 Ω and 13.2 Ω while those of secondary are 0.35 Ω and 0.65 Ω respectively. ***Find*** the voltage necessary at the sending end of transmission line when 6.6 kV is maintained at the receiving end. ***Determine*** also the sending end power factor and transmission efficiency. **(10 Marks)**

Question (4): **(25 Marks)**

a) ***What*** is end condenser method of medium lines? ***Derive*** expression for parameters of this circuit in terms of line parameters. ***Demonstrate*** your answer with net graph. **(6 Marks)**

b) ***How*** does the insulation resistance of a cable vary with its length? **(4 Marks)**

c) A sub-station supplies power at 11kV, 0.8 p.f lagging to a consumer through a single phase transmission line having total resistance of 0.15 ohm. the voltage drop in the line is 15%. If the same power is to be supplied to the consumer by two wire D.C system by a new line having a total resistance of 0.05 ohm and if allowable voltage drop is 25%. ***Calculate*** the D.C supply voltage. If the consumer get any benefits ***Show that***. **(15 Marks)**

With my best wishes
Dr. Eman Saad