Tanta University
Faculty of Engineering
Dept. of Elect. & Commun.

Electronic Materials
Ist Year,(Electrical Eng.) .
Date: / 1 / 2008, TIME: 3 Hr.

Answer the following questions:

Q.1:

a) Solids can be classified to *amorphous, polycrystalline,* and *crystalline* types. Define briefly each type.

b) The lattice constant of the GaAs is *a=0.565 nm*.
   i.   What is the type of this crystal?
   ii. Find the bond length.
   iii. Calculate the atomic radius if the atoms are packed together as rigid spheres.

c) With the aid of sketches, explain briefly the *Czochralski* technique for silicon crystal growth.

d) A silicon ingot, which should contain 10^{17} phosphor atoms/cm^3, is to be grown by the *Czochralski* technique.
   i. What concentration of phosphor atoms should be in the melt to give the required concentration in the ingot?
   ii. If the initial load of silicon in the crucible is 50kg, how many grams of phosphor should be added?

   (Phosphor atomic weight=30.97, phosphor segregation coefficient =0.35, molten silicon density =2.53g/cm^3, and Avogadro number $=6.02*10^{23}$ atoms/mol)

Q.2:

a) With the aid of sketches, discuss the effect of the distance between atoms on the energy bands in solids.

b) Define the *Fermi-Energy Level.* Draw only the energy bands diagram for the intrinsic semiconductors, N-type, & P-type extrinsic semiconductors and indicate Fermi-level and dopants energy levels on your diagram.

c) *Define* the following terms: recombination – carrier life time-diffusion current-drift current.

d) Calculate the diffusion coefficients of the holes and electrons for silicon at 300^0K if $\mu_e = 0.15\text{m}^2/\text{V.s}$ and $\mu_h = 0.05\text{m}^2/\text{V.s}$. (Boltzman constant = 1.38×10^{-23} J/K, $e=1.6\times10^{-19}$ C)

======================= *Good Luck* =======================

Tanta University	Electrical and electronic materials
Faculty of Engineering	Final examination 2007-2008
First year	Total time: Three hours

1-a) Define the following terms: Static dielectric constant, magnetic dipole moment, Curie temperature and Type I superconductors

.1-b) Write the Clausius-Mossotti equation and explain each term in this equation. Then, calculate the relative permittivity of a dielectric assuming that the number of molecules per unit volume is $18*10^{12}$ cm^{-3} and the polarizability of this dielectric is $5*10^{-32}$ F cm^2

1-c) Mention the main characteristics of the diamagnetic materials.

2-a) The positive charge of a certain atom is $3.2*10^{-19}$ C. The atom, which has a radius of $6*10^{-9}$ cm and a number of molecules per unit volume of $3*10^{19}$ cm^{-3}, is subjected to an electric field of 20 KV/cm. Calculate the equilibrium distance, the dielectric susceptibility and dielectric constant resulting from electronic polarization.

2-b) Explain the principles of the Ferro electricity.

2-c) The core of a transformer is made of laminations with a thickness of 0.8 mm. The resistivity of the core is 600 $\mu\Omega$.m. If the total loss per unit volume of the core at a frequency of 50 Hz and a maximum magnetic flux density of 1.5 tesla is 5 W, calculate the total loss per unit volume at a frequency of 60 Hz for the same magnetic field strength (coercive force).

3) Rewrite the following sentences after _full_ correction:

- Piezoelectricity is produced by changing the operating temperature of some conductors that have uniform charge distribution
- Superconductors contain natural magnetic moments
- Permanent magnets represent an extreme case of diamagnetism
- When an atom with a radius of "R" and a charge of "q" is subjected to an electrical field of "E", the equilibrium distance "d_E" between charges due to the electronic polarization is given by: $d_E - \dfrac{8\pi\varepsilon_0}{R^2} q^2 E^3$
- An external electrical field causes polarization only by separating the positive and negative charges and producing dipole force.
- Superconductors have always an electrical resistance of zero under all conditions

Good luck

جامعة طنطا

كلية الهندسة - قسم هندسة الحاسبات والتحكم الآلي

امتحان الفصل الدراسي الأول للعام الجامعي ٢٠٠٧/٢٠٠٨   الزمن : ثلاث ساعات   يناير ٢٠٠٨

الفرقة الأولى - هندسة كهربية

المادة : برمجة الحاسب (١)

أجب عن الأسئلة الأربعة الآتية: (النهاية العظمى   ٦٠ درجة)

السؤال الأول: (٢٢ درجة)

(أ)   اذكر أنواع المؤثرات المستخدمة في لغة فورتران ٧٧؟ ولنذكر وظائفها وقواعد الأولوية في تنفيذها؟ (٨ درجات)

(ب) اكتب التعبير التالي بلغة فورتران ٧٧ :(٣ درجات)

$$Q = \frac{A}{3B + \dfrac{C}{D + AB}}$$

(ج) أذكر استخدام الأوامر التالية في لغة الفورتران: (٥ درجات)

PROGRAM – DATA – CHARACTER – FUNCTION – GOTO

(د)   اكتب برنامج لحساب مضروب عدد صحيح موجب. يتم قراءة العدد والتأكد من أنه رقم صحيح موجب وإلا يتم طبع رسالة خطأ تحدد نوع الخطأ وطباعة المضروب علي الشكل التالي:(٦ درجات)

Factorial of xx   is xxxxxx

السؤال الثاني: (٢٠ درجة)

(أ)   اكتب برنامج يقرأ عدد صحيح موجب ثم يطبع الأرقام المكونة لهذا العدد وكذلك مجموع تلك الأرقام.

مثال: العدد ٢١٥ يطبع ٥ ثم ١ ثم ٢ ثم يطبع ٨ . (٦ درجات)

(ب) ارسم خريطة التسلسل واكتب برنامج لقراءة رقم جلوس الطالب واسمه ودرجته (كل طالب في سطر مستقل) عدد الطلاب غير معلوم مسبقا. ويحسب القيمة المتوسطة لدرجاتهم وطباعة عدد الطلاب وكذلك القيمة المتوسطة ورقم جلوس الطالب الحاصل على أعلى الدرجات. (١٤ درجة)

• لإنهاء البرنامج يتم تغذيته بقيمة سالبة

• طباعة المخرجات بالتنسيق التالي:

Total Number of Students are   xxxx

The Average Degree   xxx.xx

The Student Number xxxx has xxx Degree.

(انظر الصفحة التالية)

السؤال الثالث: (١٢ درجة)

(أ) استخدم برنامج وظيفي فرعي (Function Suborogram) للبحث عن ترتيب قيمة معينة في مجموعة من الأرقام الصحيحة المرتبة تصاعديا إن وجدت وإلا يرجع القيمة صفر. (٦ درجات)

(ب) اكتب برنامج يقرأ العرض والطول لمجموعة من المستطيلات ويطبع المحيط والمساحة لكل مستطيل وفي النهاية يطبع عدد المستطيلات بتنسيق مناسب. (٦ درجات)
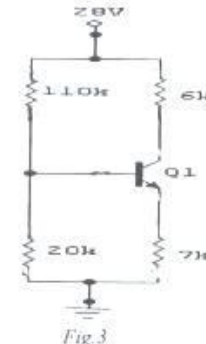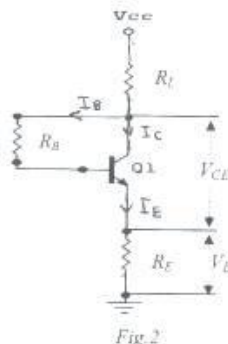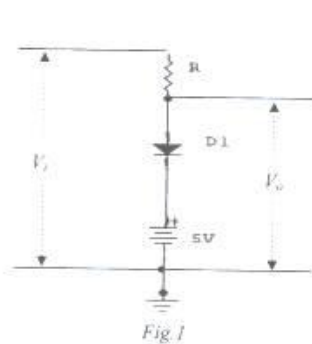

السؤال الرابع: (١٤ درجة)

(ا) اكتب برنامج يقرأ مجموعة من الأرقام الصحيحة الموجبة وفي النهاية يطبع عدد هذه الأرقام وكذلك مجموعة الأرقام بعد ترتيبها تنازليا. (٨ درجات)

(ب) استخدم دالة التعليمة الواحدة (STATEMENT FUNCTION) لعمل جدول بقيم الدالة $Y = X^2$ حيث يحتوي العمود الأول على قيمة X بدءا بالقيمة $X = 0$ وبزيادة مقدارها 0.25 حتى القيمة Final المقروءة من لوحة المفاتيح وطباعة الناتج بالشكل التالي: (٦ درجات)

X	Y
XX.XX	XXX.XXX

مع أطيب الأمنيات بالتوفيق والنجاح

الکترونیات هندسة کهرب

Tanta University
Faculty of Engineering
Dept. of Elect. & Commun.

Electronics 1.
1st Year,(Electrical Eng.) .
Date: 17/1/ 2008;Time: 3Hr.

Answer the following questions:

Q1) Define the following terms:
- Doping in semiconductors.
- Zener reverse equivalent circuit .
- Depletion capacitance in PN junction.
- Laser diode Condition, that acts as a LED ? and why ?.

Q2a) Draw a diode circuit that generates an OR logic function with three inputs ,hence, write the truth table (consider ideal diodes & logic 0 → ov,logic1→ 5v).

b) State the function of circuit shown in Fig.1, and draw its transfer characteristics. If V_i is a 1 kHz, and 8 volt peak sine wave, sketch the V_o waveform. *(Assume a germanium diode).*

Q3) A practical bridge rectifier uses a diodes having $R_f = 4\,\Omega$, transformer secondary voltage = 20 v (rms) ,load resistance = 5 kΩ, and has a winding resistance of 10 Ω.
Draw this circuit diagram, and, hence, find *(Assume a silicon diode):-*

1. Peak of the o/p voltage and o/p current.
2. Average values of voltage and current.
3. Ripple factor .
4. Peak inverse voltage (PIV) .

Q4) Draw CE & CC configurations , and hence, find:
- The current gain in each case.
- Relation between α and β .
- Methods for transistor biasing .
- Method to stabilize the o/p current against changes in β.

Q5 a) For the circuit shown in Fig.2, if $V_{cc} = 25$ volt , $R_B = 440$ kΩ, $R_L = 10$ kΩ, $R_E = 11$ kΩ, and β =110. Find: $I_{C(sat)}$, V_C, V_E, V_{CE}, and K_β {*N.B.* $K_\beta = 1 - (I_C/I_{C(sat)})$}.
b) If the value of R_B changed to 550 kΩ, what is the value of K_β? Comment on the answer.

Q6) For the circuit of Fig.3, Assume silicon material and β =80 , draw the dc load line and mark the Q-point of the circuit, using ;
1) Approximate method.
2) Accurate method.

Fig.1   Fig.2   Fig.3

=Good Luck ,Prof. M. Nasr =

Tanta University, Faculty of Enginering
Computers and Automatic control Dept.
Final term Test
Time allowed : 3 hours

Subject: Logic Design
Instructor: Dr Amany Sarhan

Answer the following questions:

Question (1)

Choose the correct answer then discuss each sentence in more details (you can use drawings in your discussion):

1- A 1-to-4 DeMultiplexer has .... Inputs
   (a) 4   (b) 1   (c) 2

2- To make the output of multiplexer=0, you can ....
   (a) put 0's on the select inputs
   (b) put 0's on all multiplexer inputs
   (c) put 1's on the select inputs

3- A carry-look ahead circuit is used to ....
   (a) minimize the carry delay in the n-full adder circuit
   (b) minimize the number of gates used in the n-full adder circuit
   (c) make the n-full adder circuit able to subtract also

Question(2)

1- Give possible usage of the following circuits in the real-life applications
   (a) Full Adder   (b) Decoder   (c) Encoder

2- What are the differences and similarities between a demultiplexer and a decoder?
If you do not have a 2-to-4 decoder and you need it to implement a circuit, but you have a number of demultiplexers, which demux will you use instead of the decoder and how will you use the inputs and outputs.

3- How to convert 4-bit adder into 4-bit substractor just by changing the inputs? Discuss the idea of the circuit first.

4- What is(are) the problem(s) that can happen in the encoder circuit and how to solve it (them)? Draw the truth table of 8-to-3 encoder to illustrate this.

Question(3)

1- Design a combinational circuit that subtracts 5 from a 4-bit BCD (Binary Coded Decimal) number. If the resultant number is negative, make a suggestion of how to deal with it.

2- Design a combinational circuit that detects the occurrence of a number that is divisible by 3 in a 4-bit input number. It also should give the result of division of this number by 3 if it is divisible by it.

Tanta University, Faculty of Enginering
Computers and Automatic control Dept.
Final term Test
Time allowed : 3 hours

Subject: Logic Design
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Question(4)
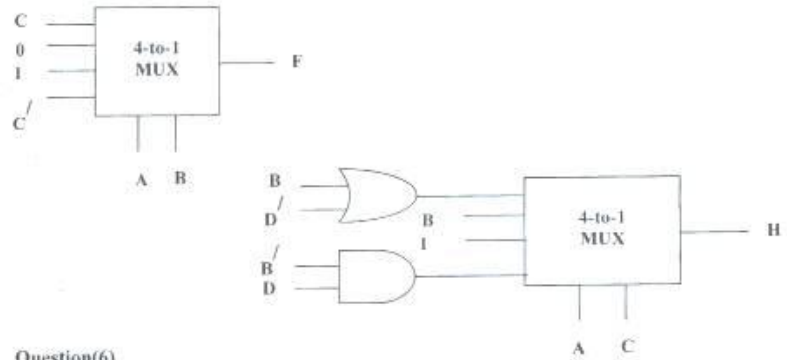
Simplify the following functions using Karnaugh map:

(a) $F(A,B,C) = \sum (0,2,6,7)$

(b) $M(A,B,C,D) = \sum (6,9,10,11)$

(c) $H(A,B,C,D) = \prod (1,7,8,9,12,14,15)$, don'tcare $= \sum(0,3,4)$

Choose only one of the following questions

Question(5)

Given the following multiplexer circuits, can you deduce the functions that were implemented? Also put these functions in the sum of minterms form after you get them.

Question(6)

Implement the following function using

(i) Decoder   (ii) Multiplexer

$F(A,B,C) = ABC + A'B + B'C$

If you are requested to implement it with a **demultiplexer**, how will you do this?

With my best wishes, Dr Amany Sarhan

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Tanta University

Faculty of Engineering

1st year: Mechanics

1st term

10/1/2008

Mathematics

3 hours.

Answer the following questions.

1) a- Find the domain of definition of the function
$$f(x,y) = \ln (25 - x^2 - y^2)(x^2 + y^2 - 9)$$

b- Discuss the maximum and the minimum values of
$$f(x,y) = x^2 + 2xy + 2y^2 + 2x + y.$$

c- If $z = f(x,y)$, $x = u + v$, $y = uv$. prove that
(i) $(u-v) z_x = u z_u - v z_v.$
(ii) $(u-v) z_y = z_v - z_u.$

2) a- If $w = f(x,y)$, $u^3 - v^2 = 4x + 2y$, $u^2 - 2v^3 = 5x - 2y$
Find $\dfrac{\partial w}{\partial u}$.

b- If $u = \tan^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$, prove that
$$x u_x + y u_y = \sin 2u$$

c- Evaluate $\displaystyle\iint_D \dfrac{dx\,dy}{\sqrt{x^2 + y^2}}$. Where D is the region bounded
by $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

3) a- Solve the following diff. equations
(i) $(x + y + 2)dx + (2x + 2y - 1)dy = 0.$
(ii) $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$

b- Solve the diff. equation
$$\dfrac{1}{y}\dfrac{dy}{dx} + x \ln y = x^3.$$

c. Find the orthognal trajectories of the familly of circls $x^2 + y^2 = 2cy$, c is constant.

4) a. Compute the Wronskian for the set of functions $3, \sin^2 x, \cos^2 x$ and then discuss the independancy of this set.

b. Solve the following diff. equations
(i) $(D^2 + D + 1)y = \sin 2x$
(ii) $(D^2 - 6D + 9)y = x^3 e^{3x}$

c. By using the method of undetermind coefficients solve the diff. equation
$$y'' + 2y' + y = x^2 + x$$

With my best wishes.
Prof. Dr Enas Lashien