

PROBLEM # 3 (35 marks)

I- Convert the following function into product of maxterms:

$$M(A,B,C) = \sum m(0, 2, 3, 5)$$

Then build the truth table corresponding to this function.

Finally, simplify the function into sum of products and draw the circuit. (15 marks)

II- Design a circuit that accepts 4-bit binary number and generates its BCD corresponding number.

(10 marks)

III- Draw the circuit of 4 – to – 1 MUX. Write down the equation that connects its input and output and discuss how it works. (10 marks)

إنتهت الأسئلة

Good luck everyone,

Assoc. Prof. Dr. Amany Sarhan



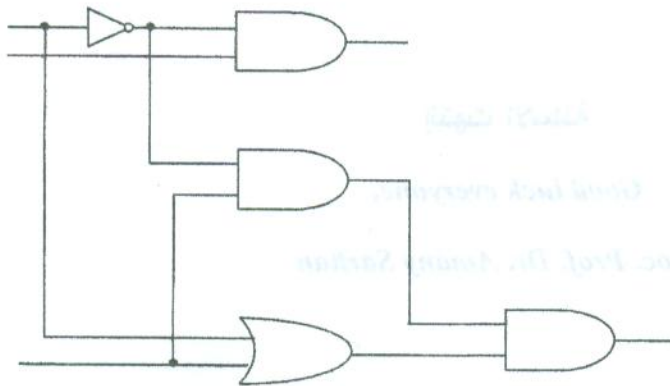
Notes:

Systematic arrangement of calculations and clear neat drawings are essential.
Any data not given is to be assumed

الإمتحان مكون من 3 أسئلة في صفتين

PROBLEM # ONE (25 marks)

I- Convert the following AND-OR-NOT circuit into all NAND and all NOR gate. Compare between the two circuits and choose the best of them. (10 marks)



II- State whether the following statements TRUE or FALSE. Then make notes on each of the following statements: (15 marks)

- 1- A full adder can be constructed by two half adders and an AND gate
- 2- The delay in a ripple (parallel) adder is constant whatever the number of bits of the numbers being added
- 3- In a comparator circuit, to judge that $A_i=B_i$, we express that as the following relation:
 $X_i = A_i'.B_i + A_i .B_i'$
- 4- The decoder is constructed from a bank of OR gates followed by an AND gate.

PROBLEM # TWO (25 marks)

I- Simplify the following functions into product of sums:

$$F1(A,B,C) = \sum m(1, 2, 3, 6, 7)$$

$$F2(W,X,Y,Z) = \prod M(0, 2, 3, 5, 8, 9, 11, 12, 15)$$

(10 marks)

II- Implement the following function in three forms:

- a- using decoder
- b- using Multiplexer
- c- using simplified form

$$H(A,B,C) = A B C' + A' B' + B' C$$

(15 marks)

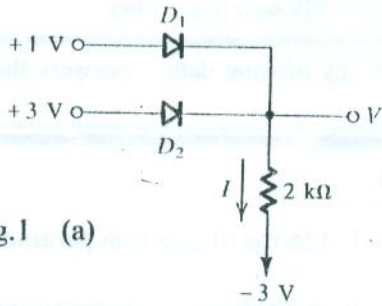
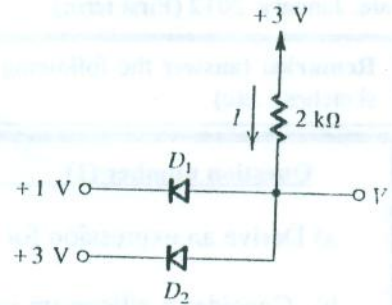


Fig.1 (a)



(b)

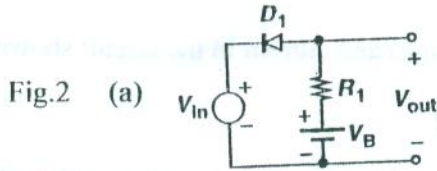
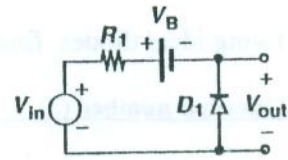


Fig.2 (a)



(b)

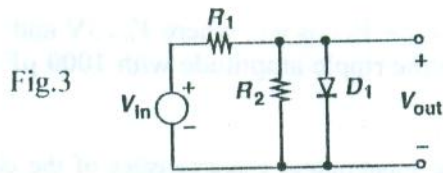


Fig.3

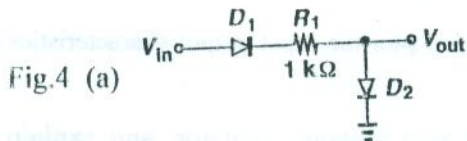
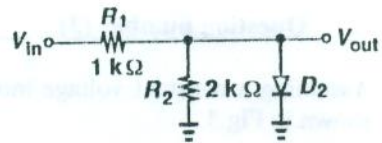


Fig.4 (a)



(b)

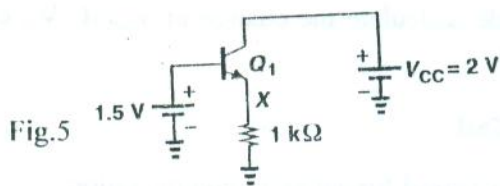


Fig.5

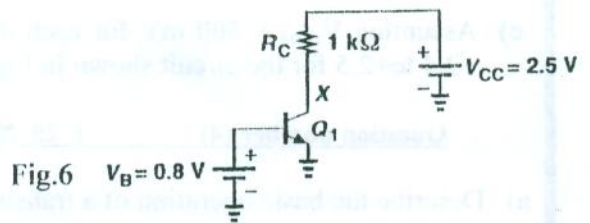


Fig.6

Good Luck

Course Title: Electronics (1)
Date: January 2012 (First term)Course Code: EEC1101
Allowed time: 3 hrsYear: First Year
No. of Pages: (2)

Remarks: (answer the following questions... assume any missing data... answers should be supported by sketches...etc)

Question number (1) (25 Marks)

- Derive an expression for the built in potential in terms of junction parameters.
- Consider a silicon pn junction at $T = 300^\circ \text{K}$, with doping concentration of $N_A = 10^{16} \text{cm}^{-3}$ and $N_D = 10^{15} \text{cm}^{-3}$. Assume that $n_i = 1.5 \times 10^{10} \text{cm}^{-3}$ and the capacitance at zero bias = 0.5 pF. Calculate the junction capacitance at $V_R = 1\text{V}$ and $V_R = 5\text{V}$. Discuss your results.
- Using ideal diodes, find the values of voltages and current in the circuit shown in Fig.1.

Question number (2) (25 Marks)

- Derive an expression for the ripple voltage at the output of a rectifier, and explain how can the magnitude of the ripple voltage be reduced.
- A rectifier is driven by a sinusoidal input, $V_{in} = V_o \cos \omega t$, where $V_o = 3\text{V}$ and $\omega = 2\pi(60 \text{Hz})$. Assuming $V_{D_{on}} = 800 \text{mV}$, determine the ripple amplitude with 1000 μF capacitor and a load resistance of 30 Ω .
- Using an ideal model for the diodes, Plot the input/output characteristics of the circuit shown in Fig.2. Assume $V_B = 2\text{V}$

Question number (3) (25 Marks)

- Assuming a constant voltage model for the diodes, plot the input/output characteristics of the circuit shown in Fig.3.
- Describe a simple circuit that can be used as a voltage regulator, and explain what is the difference between line regulation and load regulation?
- Assuming $V_{D_{on}} = 800 \text{mV}$ for each diode, calculate the change in V_{out} if V_{in} changes from +2.4 to +2.5 for the circuit shown in Fig 4

Question number (4) (25 Marks)

- Describe the basic operation of a transistor biased for active region operation.
- In the circuit shown in Fig.5, determine V_x , if $I_S = 6 \times 10^{-16} \text{A}$. Assume $I_E = I_C$
- In the circuit shown in Fig.6, determine V_x . Assume $V_A = 5\text{V}$ and $I_S = 5 \times 10^{-17} \text{A}$, $V_{BE} = 0.8\text{V}$

٣ - اكتب خوارزمية وارسم خريطة التسلسل واكتب برنامجا بلغة سي ++ (C++) يعطى قيما ابتدائية لمصفوفة أحاديه البعد بها ٢٠ عنصر ويقوم البرنامج بطباعة المصفوفة بترتيبها الاصلى و يرتب عناصرها تصاعديا ثم يطبعها مره أخرى.

السؤال الثالث:

١ - ارسم خريطة التسلسل واكتب برنامجا بلغة سي ++ (C++) لحساب وطباعة مضروب عدد صحيح موجب يتم إدخاله عن طريق لوحة المفاتيح بطريقة المحادثة وإذا حدث إدخال رقم سالب بطريقة الخطأ يتم طباعة عبارة " إدخال خاطئ ، العدد سالب لا يوجد مضروب "

٢ - اكتب برنامجاً لحساب قيمة دالة جاوس للكثافة (Gaussian density function) وذلك للقيم $x = 0.00, 0.001, 0.002, \dots, 10.0$ وطباعة الناتج في تقرير كالتالي:

Density Function

xxx.xxxx

x

xxx.xxx

٣ - اكتب خوارزمية واكتب برنامجا بلغة سي ++ (C++) لحساب وطباعة قيم جذور معادلة من الدرجة الثانية

$$y = ax^2 + bx + c$$

علما بان:

(١) إذا كانت a تساوي صفرا فان الجذر يساوي $x = -c/b$

(٢) إذا كانت a لا تساوي صفرا فيتم حساب المميز d من العلاقة: $d = b^2 - 4a*c$

ويتم حساب الجذور حسب قيمة المميز d كالتالي:

أ- إذا كان المميز d اقل من صفر ، لا يوجد جذر حقيقي (no real root)

ب- إذا كان المميز d اكبر من أو يساوي صفرا فان الجذور تساوي:

$$x_1 = (-b - \sqrt{d})/(2a) , x_2 = (-b + \sqrt{d})/(2a)$$

السؤال الرابع:

١ - اكتب برنامجاً بلغة سي ++ (C++) يقرأ أطوال عدد من الأشخاص ويخزنها في مصفوفة (heights) ويحسب متوسط هذه الأطوال. يتم إدخال الأطوال باستخدام لوحة المفاتيح. ويتم التوقف عن الإدخال عند قراءة قيمة سالبه.

٢ - ارسم خريطة التسلسل واكتب برنامجا لحساب مجموع حدود المتسلسلة الآتية:

$$\text{Sum} = 1 + \frac{x}{1!} + \frac{x^3}{3!} + \frac{x^5}{5!} + \dots + \frac{x^n}{n!}$$

إلى m حدا بحيث:

يتم إدخال عدد الحدود المراد جمعها وكذلك قيمة x بطريقة المحادثة، و يطبع تقريرا بالشكل التالي:

$$\text{Sum of } xxx \text{ Terms (at } x = xx.xx) = xxx.xxxx$$

٣ - اكتب برنامجا بلغة ++ C يقوم بطباعه اسم اللون حسب الحرف المدخل من لوحة المفاتيح فمثلا إذا كان الحرف b أو B يطبع BLUE وإذا كان Y أو y يطبع yellow وإذا كان r أو R يطبع RED

Course Title: **Programming 1**
Date: 26-1-2012

برمجة الحاسب ١ أولي كهرباء

Course Code: CCE1204
Allowed time: 3 hrs1st. year
No. of Pages: (2)**أجب عن جميع الأسئلة الآتية:****السؤال الأول:**

١- أكتب المقدار الجبري الآتي بلغة سي ++ (C++) موضحاً ترتيب تنفيذ العمليات:

$$\text{Quantity} = \log_{10} (e^{-5t} + \sqrt{|LC|}) \cdot \cos \frac{2\pi f.t}{R}$$

٢- ارسم خريطة التسلسل وأكتب برنامجاً لطباعة جدول تحويلات درجات الحرارة من مؤوي إلي فهرنهايتي علماً بأن معادلة التحويل من مؤوي إلي فهرنهايتي كالتالي:

$$\text{Fahrenheit} = \text{Centigrade} \times \frac{9}{5} + 32$$

يتم إدخال درجة الحرارة الابتدائية والنهائية والزيادة في كل سطر بالجدول بطريقة المحادثة وصغير.
طباعة المخرجات بالتنسيق التالي:**Temperature Conversion Table**Degrees , Fahrenheit Degrees , Centigrade
xxxxx.xx xxxxx.xxx

٣- أكتب الكود التقريبي والبرنامج المناظر لحساب مساحة (AREA) مجموعة من أشباه المنحرف (Trapezoidal) بمعلومية القاعدتين المتوازيتين (Base1 , Base2) والارتفاع (Height) وكتابة المخرجات كالتالي:

Area (square cm)	Height (cm)	Base2 (cm)	Base1 (cm)
xxxxx.xx	xxxx.xx	xxx.xx	xxx.xx

يتم إدخال أطوال القاعدتين المتوازيتين والارتفاع عن طريق لوحة المفاتيح ولإنهاء البرنامج يتم إدخال أرقام سالبة (المساحة = نصف مجموع القاعدتين في الارتفاع).

السؤال الثاني:

١- يتم تصنيف طراز (Type) جهاز قياس على أنه طراز First ، طراز Second ، طراز Third أو طراز Fourth اعتماداً على قيمة الخطأ (Error) الناتج عن القياس كما هو مبين بالجدول الآتي:

الخطأ (Error)	الطراز Type
Error ≤ 0.05	First
0.05 < Error ≤ 0.1	Second
0.1 < Error ≤ 0.15	Third
0.15 < Error	Fourth

ارسم خريطة التسلسل وأكتب برنامجاً لقراءة قيمة الخطأ لأكثر من جهاز وحساب وطباعة طراز الجهاز المناظر لكل قيمة خطأ تبعاً لما يلي:

- يتم حساب عدد الأجهزة وطباعة العدد في آخر التقرير.
- لإنهاء البرنامج يتم تغذيته بعدد سالب.
- طباعة المخرجات بالتنسيق التالي:

Report of Types

Instrument's Type	← ١٤ مسافة	Error	← ٧ مسافات	Instrument's Nr.
-----		x.xx		xxx

٢- أكتب برنامجاً لتحديد القيمة العظمى (Maximum) والقيمة الصغرى (Minimum) لمجموعة من البيانات العددية الحقيقية يتم إدخالها إلى الحاسب بطريقة المحادثة ثم طباعة تقرير حسب اختيارك الشخصي.

The third question. (15 Degrees)

For the circuit given in Fig.(3) , find the value of Z_L that will absorb the maximum power and calculate this maximum power & also find the power factor .

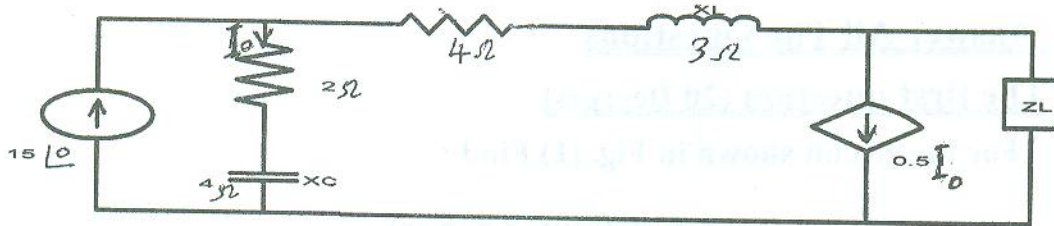


Fig .(3)

The fourth question (10 Degrees)

For the circuit shown in Fig. (4) Find ; i_1, i_2 & i_3 .

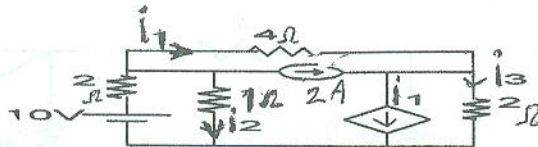


Fig .(4)

The fifth question (10 Degrees)

For the circuit shown in Fig. (5) Find:

- V_o & input power factor .
- The value of capacitor which must be connected to improve the power factor to unity .

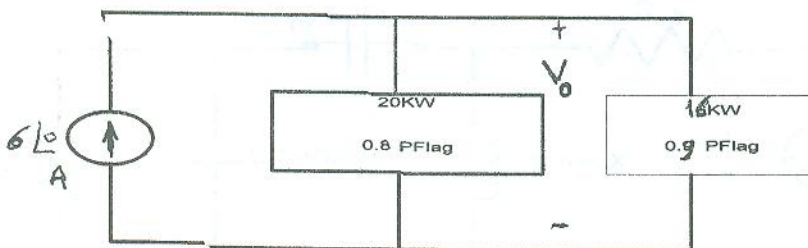


Fig .(5)

The sixth question (20 Degrees)

- (A) For series resonant circuit of Fig.(6), (i) Find the circuit capacitor for resonance frequency of 50 KHz & coil resistance for circuit quality of 10 ;(ii) The circuit bandwidth ; (iii) The minimum output voltage & output voltage at cutoff frequency ;(iv) Sketch the output voltage versus frequency & what is the name of this filter.

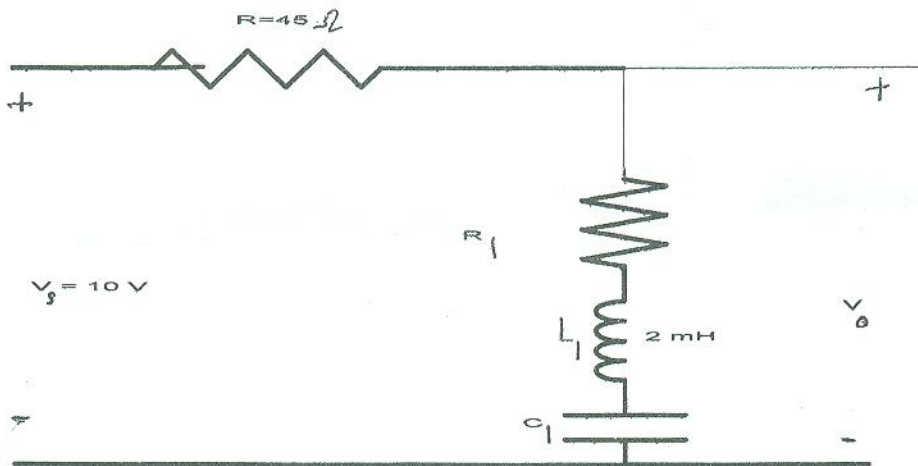


Fig.(6)

- (B) Determine the admittance parameters of the circuit shown in Fig (7) & draw its equivalent circuit.

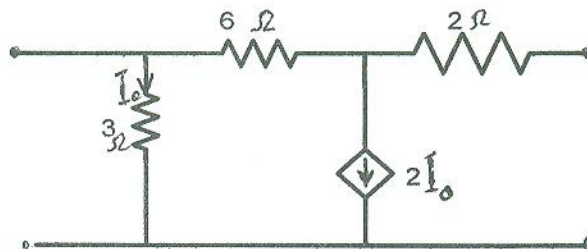


Fig. (7)

Good Luck



Course Title: Electric circuit (1)
Date: 8/1/2012 (First term)

Course Code: EPM1101
Allowed time: 3 hrs

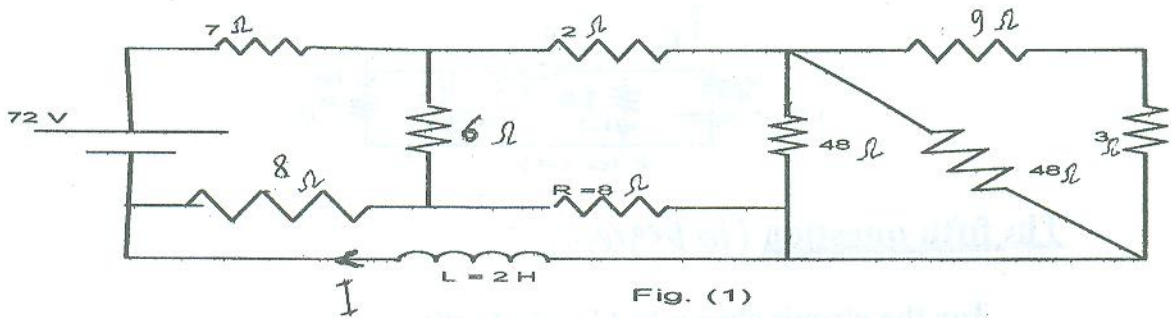
Year: 1st
No. of Pages: (3)

Answer All The Questions

The first question (20 Degrees)

For the circuit shown in Fig. (1) Find :

- a) The current I & P_s (source power).
- b) Repeat (a) if the the resistor R is opened .
- c) Repeat (a) if the the resistor R is short circuit.



The second question. (15 Degrees)

For the circuit shown in Fig. (2) Find the instantaneous current in the coil & sketch it .

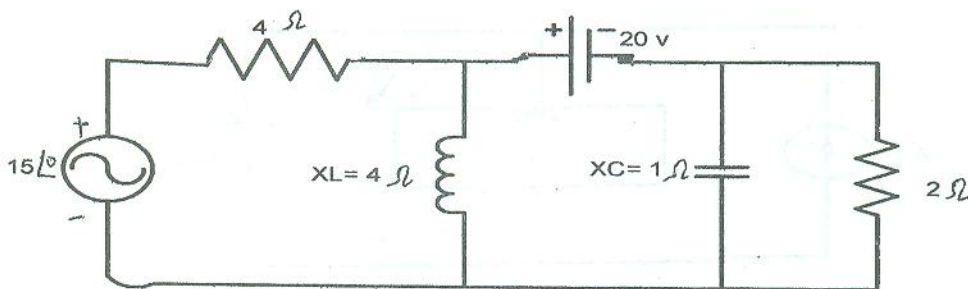


Fig. (2)



Course Title: Eng. Math.2(a)

First Year Elec.

Date: 22/1/2012

Allowed time: 3 hrs

No. of Pages: 1

Problem number (1) (30 Marks)

a- Evaluate the particular solution of the problem:

$$(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0, y(0) = 1.$$

b- Solve the d. e. $(D^2 + D)x = \cos(2t + 3)$, $D = \frac{d}{dt}$.c- Find the general solution of the d. e. $(D^2 - 4D + 4)y = \frac{e^{2x}}{x}$.d- Obtain the orthogonal trajectories of the family of cardioids $r = a(1 + \cos\theta)$.**Problem number (2) (30 Marks)**a- Find both the general and singular solutions of the equation $(xy' - y)^2 - y'^2 = 1$.b- Solve the differential equation $x^2y''' + 3xy'' + y' = x^2 \ln x$.c- Find the general solution of the d. e. $[(x + 2)D^2 - (2x + 5)D + 2]y = (x + 1)e^x$.d- Evaluate $\int_{x=0}^a \int_{y=0}^{a-\sqrt{a^2-x^2}} \frac{xy \ln(x+y)}{(y-a)^2} dy dx, a > 0$.**Problem number (3) (30 Marks)**a- Evaluate $\int_0^{\infty} e^{-ax} \cos bx dx$, then deduce the value of the integral $\int_0^{\infty} xe^{-x} \sin x dx$.b- The surfaces $f(x, y, z) = x^2 + y^2 - z^2 = 1$ & $g(x, y, z) = x + y + z = 5$ intersect in a curve c . Find the line tangent to c at the point $(1, 2, 2)$.c- Find the absolute maxima and minima of the function $f(x, y) = x^2 - xy + y^2 + 1$ on the Δ plate bounded by the lines $x = 0, y = 4, y = x$.d- Find the envelope of the family of straight lines $x \cos \alpha + y \sin \alpha = 2$.e- Find the volume of the solid bounded by the paraboloid $x^2 + y^2 = 4az$ and the plane $x + y + z = 2a, a > 0$.

With my best wishes Dr. Abdallah Shalaby

Problem number (2) (15 Marks)

- a) Derive an equation to describe the variation of the dielectric constant with frequency using the simplified formula. Assume that $\alpha_0 = 6 \times 10^{-36} \text{ F m}^2$ and $N = 25 \times 10^{22} \text{ m}^{-3}$ and calculate the value of the dielectric constant at an angular frequency of $1/\tau$. **(5 points)**
- b) Compare between the characteristics of diamagnetic and paramagnetic materials. **(5 points)**
- c) Mention some of the applications of superconductors and explain the advantages of using superconductors in each application. **(5 points)**

Problem number (3) (15 Marks)

- a. What is meant by Hall Effect? Explain an experiment to determine the mobility of electrons? **(5 points)**
- b. Deduce the relationship between the current density and resistivity in semi conductor? **(5 points)**
- c. The lattice constant of a face centered cubic structure is 4.75 \AA **(5 points)**
- i.) Calculate the surface density of atoms for a (110) plane and (111) plane.
- ii.) Determine the volume density of atoms.

Problem number (4) (15 Marks)

- a) Explain how the holes contribute in the conductivity. **(5 points)**
- b) An intrinsic semiconductor (silicon) has $5 \times 10^{28} \text{ atoms/m}^3$ at 27°C room temperature, there are 1.5×10^{16} electron-hole pairs **(10 points)**
- i- Find the conductivity of silicon at 27°C
- ii- If the above material is doped with Indium atoms at the rate of 1 atom per 10^7 silicon atoms. Find the conductivity of the doped material at room temperature.
- iii- If the conductivity increases at rate of 5% per 1°C . Find the conductivity of silicon at 41°C . The given data is: $\mu_p = 0.048 \text{ m}^2/\text{V}_s$, $\mu_n = 0.135 \text{ m}^2/\text{V}_s$, $q = 1.602 \times 10^{-19} \text{ C}$, $n_i = 1.5 \times 10^{16} / \text{m}^3$.

Good Luck

Course Examination Committee

Dr. Salah Khames

Dr. Ahmed Refaat

Course Title: Electrical and electronic materials
Date: January 2012 (First term)Course Code: EEC/EPM1160
Allowed time: 3 hrsYear: First year
No. of Pages: (2)

الإمتحان مكون من ٤ أسئلة في صفتين

Problem number (1) (15 Marks)

Choose the Best answer:

(4 points)

- i) The ferromagnetic materials are widely used because of their:
1. low price
 2. strong interaction between internal dipole moments
 3. very low resistance
 4. mechanical properties
- ii) The magnetic dipole moment is the product of:
1. current and dielectric constant
 2. current and frequency
 3. current and area
 4. current and electric field
- iii) hysteresis losses depend on:
1. frequency and coercive force
 2. frequency and resistivity
 3. coercive force and resistivity
 4. lamination thickness and frequency
- iv) The active power loss in a certain dielectric is 1779 W/m^3 when subjected to an electric field of 20 kV/cm . If the active and reactive values of the dielectric constant are respectively: 1.1 and 0.16, the frequency of the electric field in Hz is:
- 1.) 25 Hz
 - 2.) 50 Hz
 - 3.) 100 Hz
 - 4.) 150 Hz

Decide if the following sentences are true or false.

(4 points)

- i) For ferromagnetic materials, the value of μ_r is much greater than 1.
- ii) Dielectric materials can be subjected to 3 types of polarization at the same time.
- iii) Electronic and orientation polarization have common dynamics that completely differ from the dynamics of the ionic polarization regarding the response to changing forces.
- iv) Piezo electricity depends on the mechanical deformation of some crystals that have nonuniform charge distribution

An atom with a radius of $10 \cdot 10^{-6} \text{ cm}$ has a positive charge in the nucleus with a magnitude of $3.5 \cdot 10^{-19} \text{ C}$. If the atom is subjected to an electrical field of 17 KV/cm , calculate the equilibrium distance "d" according to the electronic polarization assuming a number of molecules per unit volume of $20 \cdot 10^{20}$. Calculate also the electric dipole moment, the polarization, the dielectric susceptibility and the dielectric constant after equilibrium.

(7 points)