Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 70 Marks

Faculty of Engineering

| Course Title: Electrical and electronic materials | Course Code: EEC/EPM1160 | Year: First year |
| Date: January 2011 (First term) | Allowed time: 3 hrs | No. of Pages: (2) |

الإمتحان مكون من ٤ أسئلة فى صفحتين

Problem number (1)   (15 Marks)

a) Discuss the importance of the electric dipole moment for electric material applications.   (5 points)

b) Define the Clausius-Mossotti equation and define each term in this equation. State the approximate equation giving the same relation.   (5 points)

c) An atom with a radius of $5*10^{-6}$ cm has a positive charge in the nucleus with a magnitude of $4*10^{-18}$C. If the atom is subjected to an electrical field of 15KV/cm, calculate the equilibrium distance "d" according to the electronic polarization assuming a number of molecules per unit volume of $25*10^{20}$. Calculate also the electric dipole moment, the polarization, the dielectric susceptibility and the dielectric constant after equilibrium   (5 points)

Problem number (2)   (20 Marks)

a) Calculate the active and reactive power loss in a dielectric when subjected to an electric field of 5 kV/m with a frequency of 50 Hz. The active and reactive values of the dielectric constant at this frequency are respectively 1.1 and 0.06. What is the value of tangens delta under this condition?   (10 points)

b) Discuss in detail the characteristics of the 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) Write short notes about:
   Type of solids – miller indices given an example – basic crystal structure

b) Write short notes about IC chip fabrication.

c) Find the volume density for a body centred cubic and surface density for (011) and (010) plans. Assume the atoms are touch along cubic diagonal in BCC and atom radius is 1.61 A$^{\circ}$.

P.T.O.   Page: 1/2

Problem number (4)   (20 Marks)

a) Derive an expression for the drift current density. Explain how to increase the conductivity of semiconductor.

b) Explain what is the meant by the Hall Effect?

c) The resistivity of the P region and N region of germanium diode are 6Ω.cm and 4Ω.cm respectively. Calculate the built in potential. Given that $q = 1.6 \times 10^{-19}$ c, $n_i = 2.5 \times 10^{13}/cm^3$, $\mu_p = 1800$ cm^2/Vs, $\mu_n = 3800$ cm^2/Vs and $V_T = 26$ mv at $T = 300k$.

d)
i- Determine the concentration of free electrons and holes in a sample of Germanium at 300 °k which has a concentration of donor atoms equal to 2×10^{14} atoms/cm³ and a concentration of acceptor atoms equal to 3×10^{14} atoms/cm³. Is this P or N type Germanium?

ii- Repeat part (i) for equal donor an acceptor concentration of 10^{15} atoms/cm³. Is this P or N type Germanium?

iii- Repeat part (i) for equal donor an acceptor concentration of 10^{16} atoms/cm³ and acceptor concentration of 10^{14} atoms/cm³.

Good Luck

Course Examination Committee

Dr. Salah Khames

Dr. Ahmed Refaat

Dr. Mohamed Abo El Azm

Dr. Mohamed Eid

Tanta University

Department: Physics and Engineering Mathematics
Total Marks: 85 Marks

Faculty of ring

Course Title: Eng. Math.2(a)
Date: 27/1/2011

First Year Elec.
Allowed time: 3 hrs

No. of Pages: (2)

Remarks: (answer the following problems... assume any missing data)

Problem number (1) (30 Marks)

a) Discuss the existence and uniqueness of solution of the problem:

$$\frac{dy}{dx} = \frac{2y}{x}, \quad x > 0, \ y > 0, \ y(1) = 1.$$

b) If the function $y_1 = \dfrac{2}{x}$ is a solution of the equation

$$x^2 y' + xy + x^2 y^2 = 4 .$$ Obtain the general solution of the equation.

c) Solve the d. e. $(D^2 + 2D + 3)x = t^3 e^{-2t}, \ D = \dfrac{d}{dt}.$

d) Find the general solution of the d. e. $(x^2 D^2 + 3xD + 1)y = (1-x)^{-2}.$

e) An RLC circuit has a resistance of 5 ohms, capacitance of 0.01 farad and inductance of 1/8 henry. Find the steady state current if the impressed e. m. f. is $v(t) = \sin t.$

Problem number (2) (30 Marks)

a) Find both the general and singular solutions of the equation $y = xy' + \dfrac{1}{y'^2}.$

b) Solve the d. e. $2dx + \sqrt{\dfrac{x}{y}}\, dy - \sqrt{\dfrac{y}{x}}\, dx = 0.$

c) Solve the simultaneous differential equations:

$$Dy - z = 0, \quad (D-1)y - (D-1)z = 0, \quad D = \frac{d}{dx}.$$

d) Find the general solution of the d. e.

$$[xD^2 + (1-x)D - 2(1+x)]y = (1-6x)e^{-x}.$$

e) Find $I = \iint y^2 \, dy\, dx$ over the region lies outside the circle $x^2 + y^2 = 2x$ and inside the circle $x^2 + y^2 = 4x$. [Hint: use polar coordinates]

<u>Problem number (3)</u>   (30 Marks)

a) Evaluate $\int_0^\infty xe^{-\alpha x} \sin 3x \ dx$.

b) A rectangular box open at the top is to have a volume of $32 ft^3$. Find its dimensions such that the total surface area is minimum.

c) Find the derivative of $f(x,y,z) = xe^y + yz$ at the point $p_0 = (2,0,0)$ in the direction joining the point p_0 with the point $p_1(4,1,-2)$. Find the directions along them the maximum and minimum derivatives occur. Find also the maximum and minimum values of derivatives.

d) Find the value of the constants $a, b ; c$ ∋ the vector field:
$$\underline{V} = (x + 2y + az)\underline{i} + (bx - 3y - z)\underline{j} + (4x + cy + 2z)\underline{k} \text{ is}$$
conservative field and find the potential function related to this field.

e) If $\phi(x,y,z) = xe^y + yz$. Obtain $Curl(grad\phi)$.

With my best wishes

Dr. Abdullah shalby

Tanta
Universit

Department: Elec. Power and Machines Engineering
Total Marks: 90 Marks

Faculty of
Engineering

Course Title: Electric circuits (1)
Date: January 16th 2011 (First term)

Course Code: EPM1101
Allowed time: 3 hrs

Year: 1st
No. of Pages: (2)

Problem number (1)   (20 Marks)

a) The current I_1 and I_2 in the circuit shown in Figure (1) are 10 A and 25 A respectively; (i) find the power supplied by each voltage source; (ii) show that the total power supplied equals the total power dissipated in the resistors.
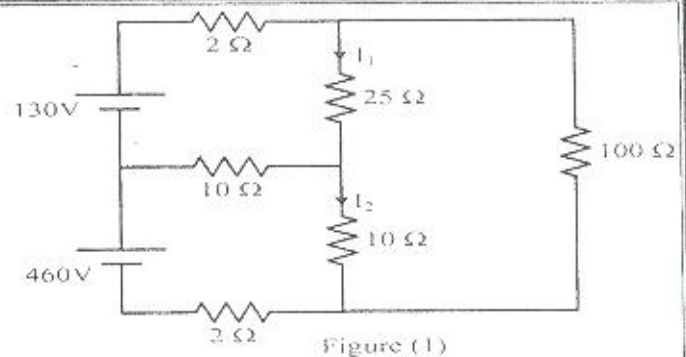
Figure (1)

b) For the circuit shown in Figure (2), find:
(i)I_1 and I_2 (ii)V_1 and V_2.
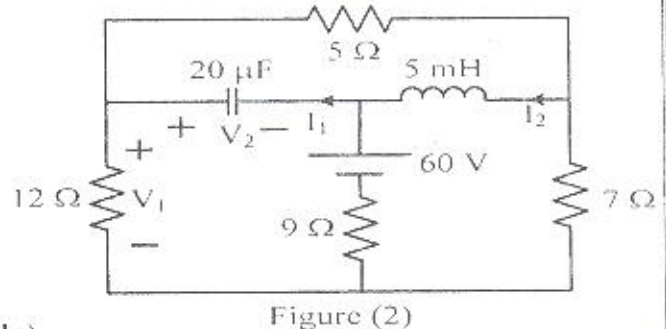
Figure (2)

Problem number (2)   (15 Marks)

For the circuit shown in Figure (3): Use source transformations or node voltage method to find the voltage V, and then calculate power delivered from the 100 V source?
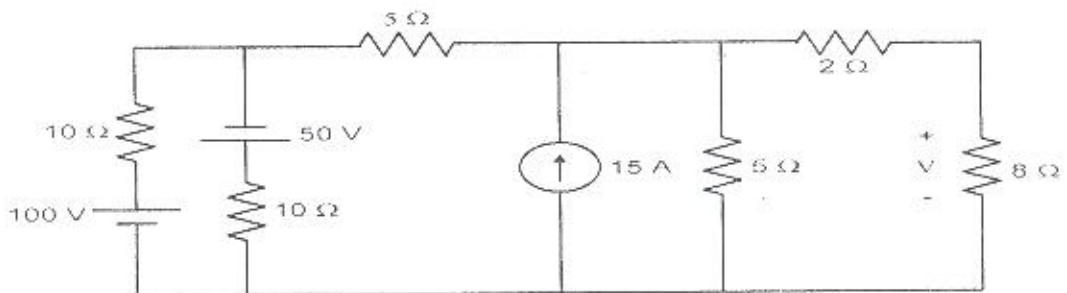
Figure (3)

Problem number (3)   (25 Marks)

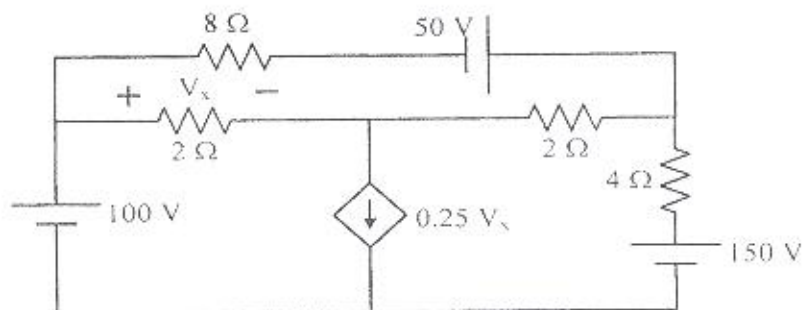a) For the circuit shown in Figure (4), use the loop current method to find V_x.

Figure (4)

b) For the circuit shown in Figure (5), find value of R_1 to delivered maximum power from the network then evaluate maximum power.
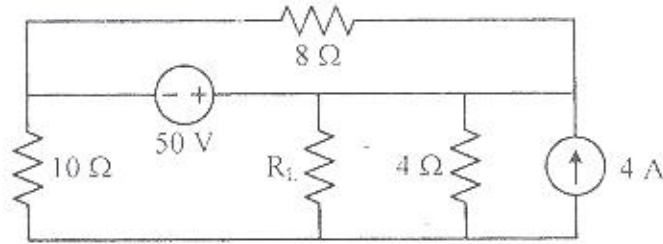

Figure (5)

Problem number (4)   (30 Marks)

a) For the circuit shown in Figure (6), Find: (i) the total number of watts, the total number of VAR, the total number of VA and input power factor; (ii) sketch the power triangle; (iii) What the parallel capacitors required improving the system power factor to 0.9 lagging power factor if supply frequency is 50Hz.
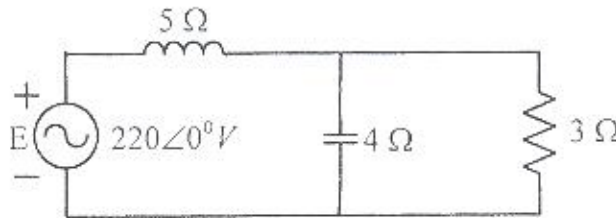

Figure (6)

b) For series resonant circuit of Figure (7), (i) find the circuit capacitor for resonance frequency of 50 kHz and coil resistance for circuit quality factor of 10; (ii) the circuit bandwidth; (iii) the minimum output voltage and output voltage at cutoff frequency; (iv) sketch the output voltage versus frequency.
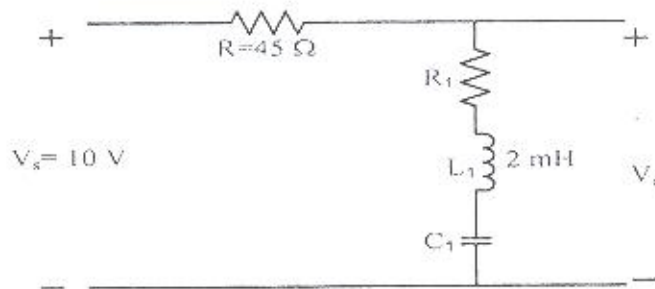

Figure (7)

c) For the network shown in Figure (8), (i) find E_1 and I_1 if $E_2 = 50806.82\angle 0^0 \ V$ and $I_2 = 98.412\angle 154.16^0 \ \Omega$; (ii) determine the maximum power transfer to Z_L between a and b, (iii) Maximum power transfer to Z_L.
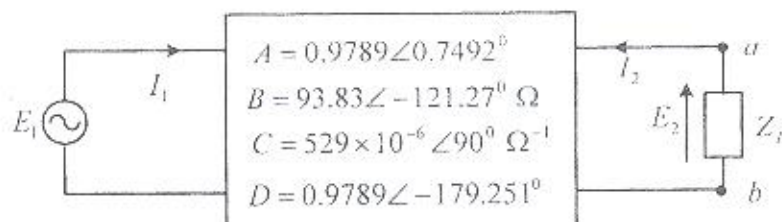

$A = 0.9789\angle 0.7492^0$
$B = 93.83\angle -121.27^0 \ \Omega$
$C = 529 \times 10^{-6} \angle 90^0 \ \Omega^{-1}$
$D = 0.9789\angle -179.251^0$

Figure (8)

Tanta University

Department: **Computers and Control Engineering**
Total Marks: 60 Marks

Faculty of Engineering

| Course Title: **Programming 1** | برمجة الحاسب ١ أولى كيرباء | Course Code: CCE1204   1st. year |
| Date: 18-1-2011 | | Allowed time: 3 hrs   No. of Pages: (2) |

أجب عن جميع الأسئلة الآتية:

السؤال الأول:

١- اكتب و نفذ برنامجاً بلغة سي ++ (C++) لإدخال ثلاثة قيم عن طريق لوحة المفاتيح بطريقة المحادثة وطباعة القيمة الأكبر ، مع طباعة نوع كل عدد زوجي أم فردي .

٢ - اكتب ونفذ برنامجا بلغة سي ++ (C++) لحساب مجموع درجات طالب في ستة عشرة مقرر يتم إدخالها عن طريق لوحة المفاتيح ثم حساب النسبة المئوية لمجموع درجاته وطباعة تقرير باسم الطالب يفيد تقدير حالة النجاح ومجموع درجاته وتقديره علما بأن التقدير يحسب كالتالي :

النسبة المئوية	٠ - ٤٩	٥٠ - ٦٤	٦٥ - ٧٤	٧٥ - ٨٤	٨٥ - ١٠٠
التقدير	راسب Fail	مقبول Pass	جيد Good	جيد جدا V.Good	ممتاز Excellent

٣ - اكتب خوارزمية وارسم خريطة التسلسل واكتب برنامجا بلغة سي ++ (C++) يعطى قيما ابتدائية لمصفوفة أحاديه البعد بها ١٠ عناصر ويقوم البرنامج بطباعة هذه المصفوفة بترتيبها الاصلي وبعد ترتيبها تصاعديا يطبعها مره أخرى

السؤال الثاني:

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 - ارسم خريطة التسلسل واكتب برنامجاً بلغة سي ++ (C++) لحساب وطباعة قيم y لجميع قيم x المحصورة بين (4) و (4-) وبفارق مقداره 0.2 حسب المعادلة التالية: $y = 6x^2 + 5x + 1$

٣ - اكتب خوارزمية واكتب برنامجا بلغة سي ++ (C++) لحساب وطباعة قيم جذور معادلة من الدرجة الثانية
$$y = ax^2 + bx + c$$

علما بأن:

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 : $d = b*b - 4a*c$

ويتم حساب الجذور حسب قيمة المميز d كالتالي:

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

ب - إذا كان المميز d اكبر من أو يساوي صفرا فان الجذور تساوي:
$x1 = (-b - \text{square root} (d))/(2a)$, $x2 = (-b + \text{square root} (d))/(2a)$

السؤال الثالث:

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 سالبة.

٢ ـ اكتب خوارزم وارسم خريطة التسلسل واكتب برنامجاً لإدخال مجموعة من الأعداد بحد أقصى عشرة (10) في مصفوفة أحاديه البعد وطباعة المصفوفة الأصلية ثم ترتيبهم وطباعتهم تصاعدياً.

٣ ـ يقدم معرضا للمشتريات خصما للزبائن علي قيمة المشتريات حسب القاعدة التالية :

إذا كانت قيمة المشتريات اقل من أو تساوي ٥٠٠ جنية يكون الخصم ٢٠% ،

إذا كانت قيمة المشتريات أكبر من ٥٠٠ وأقل من أو تساوي ١٠٠٠ جنية يكون الخصم ٣٠% ،

إذا كانت قيمة المشتريات أكبر من ١٠٠٠ جنية يكون الخصم ٤٠% ،

اكتب ونفذ برنامجا بلغة سي ++ (C++) لحساب وطباعة قيمة الخصم والمشتريات قبل وبعد الخصم مع إدخال قيمة المشتريات عن طريق لوحة المفاتيح بالمحادثة وصفير.

السؤال الرابع:

١ ـ اكتب برنامجاً لحساب وطباعة متوسط درجة الحرارة في عدد من الأيام ، وتخزن درجات الحرارة في مصفوفة ويتم إدخال قيم درجات الحرارة بطريقة المحادثة.

٢ ـ صمم برنامجا لطباعة مربعات ومكعبات الأعداد من ٢٠ إلي ٢٠٠ حسب الشكل التالي :

```
      cube(x)              square (x)   x
**************************************
      1000                 100        10
        --                   --
**************************************
```

٣ ـ 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 تقرير بالشكل التالي :

Sum of xxxx Terms (at x = xx.xx) = xxxx.xxx

مع أطيب الأمنيات بالتوفيق 💻 ا.د.م/السيد سلام

TANTA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTERS AND AUTOMATIC CONTROL
EXAMINATION (FIRST YEAR) STUDENTS OF ELECTRICAL ENGINEERING

COURSE TITLE: PRINCIPLES OF LOGIC DESGIN			COURSE CODE: CCE1102
DATE: 20- 1- 2011	TERM: FIRST	TOTAL ASSESSMENT MARKS: 85	TIME ALLOWED: 3 HOURS

Notes:

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

1/2

الإمتحان مكون من 4 أسئلة فى صفحتين

PROBLEM # ONE (15 mark)

I- Convert the function F(A,B,C)= AB'+A'C to the canonical form.
II- What is the corresponding minterm M3 (no. of variables = 4)
III- Why do we use the separate detection line in the encoder?
IV- Which form of the function we need when we use the decoder to realize logic?
V- Draw the ring counter circuit?

PROBLEM # TWO (30 marks)

I- Circle the circuits below that <u>DO NOT</u> implement (i.e. equal to) a Boolean <u>AND</u> function. (**You have to show what is the output of each circuit before making your decision**). (10marks)
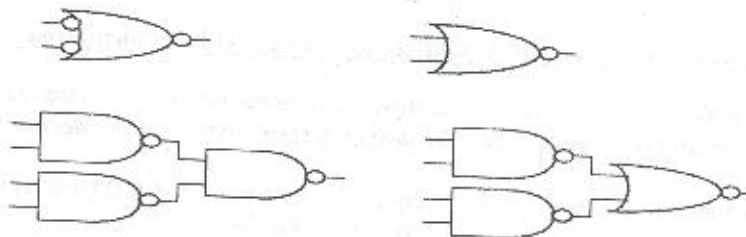
II- How to build a <u>3- to- 8</u> decoder using the <u>2-to-4</u> decoders?   (5marks)

III- Consider the following function: F(A,B,C,D) = $\sum$m(0,5,6,9,12,15)   (15marks)

a- What is the minimized Sum of Products form? How many gates does it have?
b- What is the minimized Product of Sums form? How many gates does it have?
c- Can you use XOR, in addition to AND, OR, NOT gates, to implement this circuit? How many gates does it have?
d- Draw the three circuits and mention which of them gives the less cost and which of them has the minimum time?
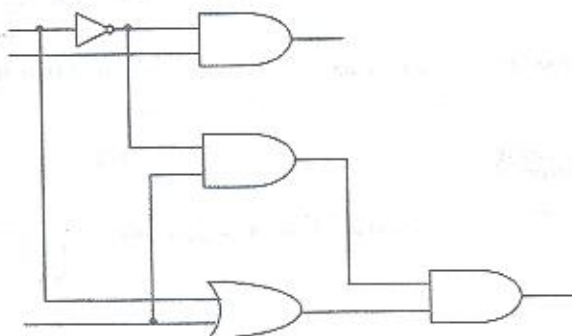
PROBLEM # 3 (30 marks)

I- What is meant by a shift register? What is the difference between it and the shift circulate registers? In shift circulate left register, if the initial value was 1101, then what will be the value stored after three clock pulses?

                    (7 marks)

Please Turn Over ⟶

II- Analyze the following logic circuit to obtain its truth table and output functions.

(8 marks)

IV- Given the four variable function $F(A,B,C,D) = \sum m(0,1,3,4,8,9,10,11,12,14)$,   (15marks)

  a- Show how to implement this using a single 8X1 multiplexer and no other logic gates. Use A, B, C as the multiplexer control inputs.

  b- Then implement it again using 4X1 multiplexer and use A and C as control inputs.

  c- Which of the two implementations is better? Why?

PROBLEM # 4 (10marks)

Solve only one of the following questions. Only the first solved one will be considered.

I- *It is well known from the X-Files series that Aliens have three arms having four fingers on each hand. So it is not so surprising that they have a base 6 number system instead of the decimal or binary numbers we use!!!!.*
Design a digital circuit that takes as input a binary coded decimal number BCD (0 to 9) which we use and generates "binary coded hexary" BCH digit (0 to 5 only) for their use.
(a) Identify your inputs and outputs. Draw a block diagram to show the whole circuit.
(b) State your assumptions about the behavior of the circuit. Build the truth table.
(c) Implement it in minimized Sum of Products form using the Karnaugh-maps then draw the circuit.

II- You are implementing an 8:1 Multiplexer that has the following specifications:
    Inputs: I_0 to I3
    Output: Z
    Control Inputs: A, B and C (A is MSB)
The input is selected based on a Johnson counter scheme (at 000 Z= I_0, at 100 Z= I_1, at 110 Z= I_2, at 111 Z= I_3). All other states select I0.
    (a) Build the truth table for this multiplexer.
    (b) Write out the functional form for this multiplexer. You should simplify or minimize.
    (c) Implement this circuit again two more time with a decoder then with an encoder.

إنتهت الأسئلة

Good luck everyone,

Assoc. Prof. Dr. Amany Sarhan

اول كهربائ

| Tanta University | Department: Electronics & Comm. Engineering
Total Marks: 100 Marks | Faculty of Engineering |

| Course Title: Electronics (1)
Date: January 2011 (First term) | Course Code: EEC1101
Allowed time: 3 hrs | Year: First Year
No. of Pages: (3) |

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

Question number (1) (20 Marks)

a) *Choose the right answer* [10 Marks]

(1) The energy band in which free electrons exist is the conduction band.

( ) True   ( ) False

(2) Recombination is when an electron falls into a hole.

( ) True   ( ) False

(3) In the active region the base-emitter junction is forward bias where as the collector-base junction is reverse-biased.

( ) True   ( ) False

(4) In the cutoff region the base-emitter and collector-base junction of a transistor are both reverse-biased.

( ) True   ( ) False

(5) In the saturation region the base-emitter and collector-base junction are forward biased.

( ) True   ( ) False

(6) For dc analysis of a transistor circuit, all capacitors are replaced by a short circuit equivalent

( ) True   ( ) False

(7) Line regulation is determined by zener current and load current.

( ) True   ( ) False

(8) The input resistance of a common base amplifier is very high .

( ) True   ( ) False

(9) In a common emitter amplifier , if the emitter bypass capacitor is removed, the voltage gain will increase.

( ) True   ( ) False

(10) A common collector amplifier has high input resistance and high voltage gain.

( ) True   ( ) False

b) (i) Determine whether each diode in Fig.1 (a ,b) is forward-biased or reverse-biased. Then determine the voltage across each diode, assuming the practical diode. [5 Marks]

(ii) A silicon pn junction is doped with $N_A = 2 \times 10^{16}$ cm^{-3} and $N_D = 4 \times 10^{16}$ cm^{-3}.Determine the built in potential at room temperature (T = 300K). How much does this potential change if N_D is increased by one order of magnitude? (assume $n_i = 1.08x \times 10^{10}$ cm^{-3}) [5 Marks]
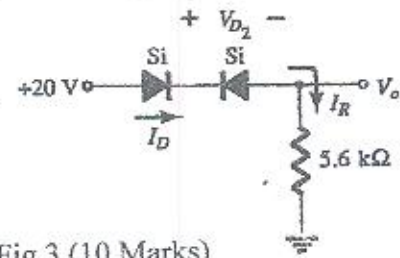

Fig.1   (a)   (b)
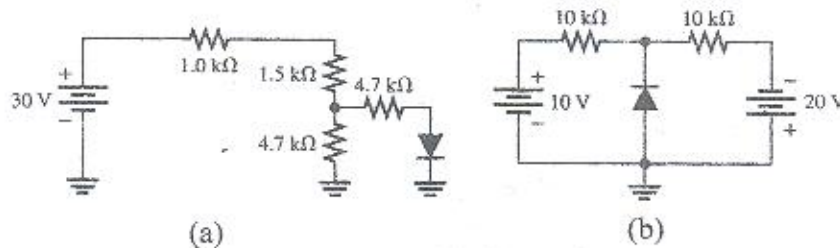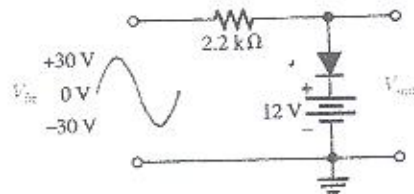
Question number (2) (20 Marks)

(a) (i) Draw the circuit diagram of a voltage doubler ,and explain its operation.   (5 Marks)

(ii) Determine I_D, V_{D2}, and V_O for the circuit shown in Fig.2. Assuming ideal diode. (5 Marks)
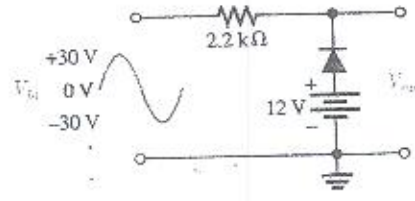
Fig.2

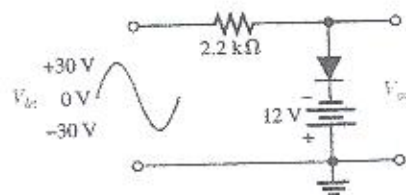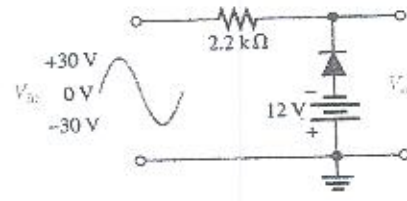**b)** Describe the output voltage waveform for each circuit in Fig.3 (10 Marks)

(a)

(b)

Fig.3

(c)

(d)

Question number (3)   **(20 Marks)**
a) Find V_{CE}, V_{BE}, and V_{CB} in both circuit of Fig.4, determine whether or not the transistors are saturated   **(10 Marks)**
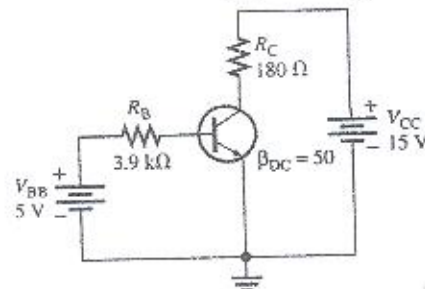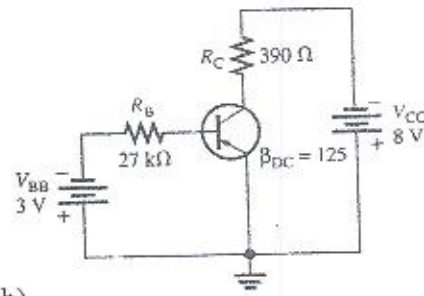
Fig.4
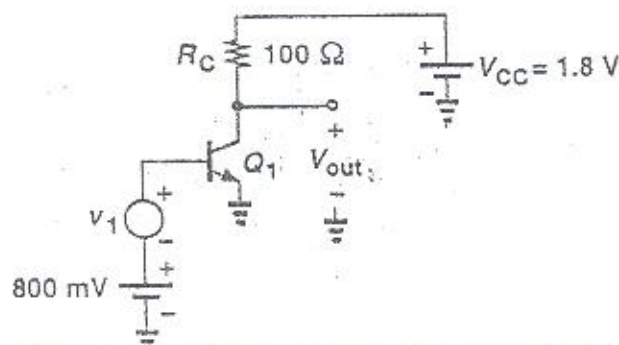(a)   (b)

b) For the circuit shown in Fig.5 assume v_1 represents a signal generated by a microphone,
   (i) verify that the transistor operates in the active mode   (5 Marks)
   (ii) Determine the output signal level if the microphone produces a 1 mV signal.
   Given $I_s = 3 \times 10^{-16}$ A , $\beta = 100$, $V_{BE} = 0.8$V, $v_1 = 1$ mV (5 Marks)

Fig.5

Question number (4)   (20 Marks)

(a) (i) A bipolar transistor carries a collector current of 1 mA with $V_{CE}= 2V$. Determine the required base emitter voltage with $V_A = \infty$ and $V_A = 20V$. Discuss your results (Assume $I_s = 2x\ 10^{-16}$ A)   (5 Marks)

   (ii) Assume a voltage source is applied between the base and collector terminals of a transistor while the collector is tied to V_{CC} and the emitter to ground. If the device operates in forward active region, prove that a change in this voltage results in no change in the collector and base current. Discuss your results   (5 Marks)

(b) For the circuit shown in Fig.6 , V_{CC} changes from 2.5 to 3V. Assuming $I_s = 1x\ 10^{-17}$ A and $V_A = 5$ V,

   (i) determine the change in the collector current of Q_1

   (ii) If we wish to decrease V_B to compensate for the change in I_C, determine the new value of V_B (10 Marks)
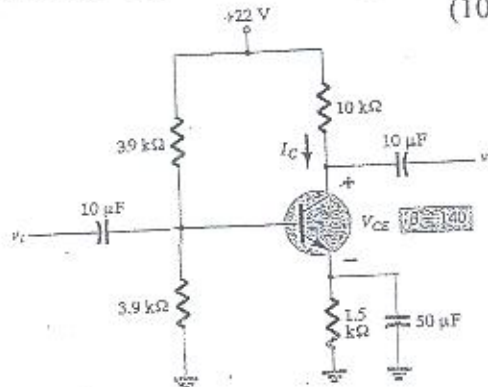
Fig.6
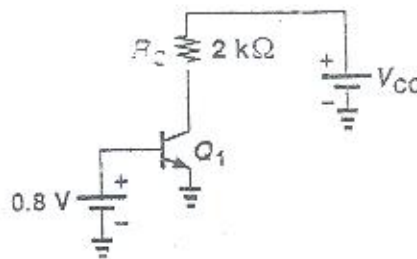
Question number (5)   (20 Marks)

(a) Determine the dc bias voltage V_{CE} and the current I_C for the voltage divider circuit shown in Fig.7
(10 Marks)

Fig.7

(b) Calculate the voltage gain and I/O impedances of the circuit shown in Fig.8 Assume $V_A = \infty$
(10 Marks)

Fig.8

(a)

(b)

Good Luck

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