Given : $\eta = 0.68$, $V_V = 0.8V$, $I_V = 15$ mA, $I_P = 10$ μA the $_p$ if $V_{BB} = 12$ V ,and $V_P = 10$ V

(b) Sketch the basic SCR over-voltage protection circuit and explain its operation?

(c) Sketch the basic elements of an optical fiber transmission link and explain its operation.

Question number (5) **(15 Marks)**

(a) (i) Explain with drawing ,whenever possible, the following terms:
1. Population Inversion
2. Carrier and optical confinement
3. Spontaneous and stimulated emission

(b) Calculate the reflectivity and the cavity length of GaAs laser. (Given : refractive index = 3.2, $\lambda = 1500$ nm and m=2)

(c) Calculate the photocurrent and gain when 8×10^{12} photon/s arriving at the surface of a photoconductor of quantum efficiency $\eta = 0.6$. The minority carrier lifetime is 0.6 nS, and the device has $\mu_n = 2000$ cm^2/s , electric field = 4000 V/cm, and $L = 8$ μm.

Good Luck

Course Coordinator: Prof. Mustafa Mahmoud Abd Elnaby

Tanta University

Department: Electronics & Comm. Engineering
Total Marks: 90 Marks

Faculty of Engineering

Course Title: Electronics (2)	Course Code: EEC1202	Year: First Year
Date: June 2012 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

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:***

1. The dominant operating process for LEDs is spontaneous emission. ***( ) True ( ) False***
2. The dominant operating process for laser diodes is stimulated emission, and for photoconductors is the absorption. ***( ) True ( ) False***
3. To obtain a low on-resistance for MOS switches, we maximize W/L and V_{GS} ***( ) True ( ) False***
4. Bipolar devices display an exponential I_C -V_{BE} dependence, while MOSFETs display a square law dependence. ***( ) True ( ) False***
5. The gate of MOSFETs draws no bias current. ***( ) True ( ) False***
6. MOS transistors operating in saturation can act as a current source. ***( ) True ( ) False***

(b) Derive an expression for the drain current (triode region) and the equivalent on-resistance in terms of MOSFET junction parameters

Question number (2) **(20 Marks)**

(a) Determine the region of operation of M1 in each of the circuits shown in **Fig.1**. (V_{TH} = 0.4V)

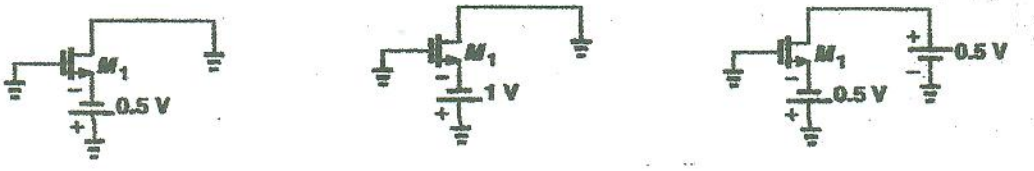


Fig.1 (a) (b) (c)

(b) An NMOS deice operating in saturation with λ =0 must provide a transconductance of 1/50 Ω. Given ($\mu_n C_{ox}$ = 200μA/V^2)

(i) Determine W/L if I_D = 0.5 mA
(ii) Determine W/L if V_{GS} - V_{TH} = 0.5 V
(ii) Determine I_D if V_{GS} - V_{TH} = 0.5 V

Question number (3) **(20 Marks)**

(a) An NMOS device carries a 1mA with V_{GS} - V_{TH} = 0.6 V and 1.6 mA with V_{GS} - V_{TH} = 0.8V . If the device operates in the triode region, calculate V_{DS} and W/L. Given ($\mu_n C_{ox}$ = 200μA/V^2)

(b) Explain the basic construction and operation of UJT and condition for a proper turn-on and turn-off. Show how it can be used as a basic element in relaxation oscillator?

Question number (4) **(15 Marks)**

(a) In a certain UJT , r_{B1}= 2.5 kΩ and r_{B2} = 4 kΩ . What is the intrinsic standoff ratio? Find the range of values of the charging resistor R_1 required for proper turn-on and turn-off of UJT

السؤال الثالث:

١. استخدم مصفوفة مكونة من سلاسل حرفية لكتابة برنامج لحساب المجموع الكلى للمبيعات الخاصة لشخص ما خلال أسبوع واحد وطباعة اسم الشخص و اليوم الذي حدثت فيه أكثر مبيعات.

٢. اكتب برنامجا لتحديد وطباعة اكبر قيمة واصغر قيمة من بين عدة قيم مدخلة مستخدما دالة فرعية لتحديد القيمة العظمى ودالة فرعية أخرى لتحديد القيمة الصغرى.

٣. اكتب برنامجا لطباعة طول الضلع والمساحة لمربع مستخدما دالة فرعية تقوم بحساب مساحة المربع بحيث نرسل لها عنوان المكان المخزن فيه قيمة طول الضلع (استدعاء بالعنوان Call by reference).

السؤال الرابع:

١. اكتب خوارزمية وارسم خريطة التسلسل واكتب برنامجا رئيسيا يستدعى دالة فرعية لترتيب مصفوفة تصاعديا والبرنامج الرئيسي يعطى قيما ابتدائية لمصفوفة أحاديه البعد بها ١٠ عناصر ويقوم البرنامج الرئيسي بطباعة هذه المصفوفة بترتيبها الاصلى وبعد ترتيبها تصاعديا يطبعها مره أخرى .

٢. اكتب برنامجا رئيسيا يستدعى دالة فرعية لإيجاد مجموع الأعداد الزوجية في مصفوفة ويتم إدخال قيم المصفوفة في البرنامج الرئيسي وتمرير قيم المصفوفة إلي الدالة بواسطة المؤشرات.

٣. اكتب خرج العبارات التالية مع اكمال ما تدل عليه النقط في عبارات المؤشر :

```
#include<iostream.h>
int main()
// let address of i = 0x55667788
{ int i =10;
  int *i_ptr =&i ;
  cout<< "\n value of ..... = "<< i  +10;
  cout<< "\n address of ..... = "<< &i +20;
  cout<< "\n value of ..... = "<< i_ptr +30;
  cout<< "\n the ..... = "<<*& i_ptr;
  cout<< "\n the ..... = "<<&* i_ptr;
   return 0;
}
```

```
#include<iostream.h>
int main( )
{
   int array[2][3] = {{1,3,5},{2,4,6}};
   cout<<array[0][0]<<endl;
   cout<<array[1][0]<<endl;
   cout<<array[1][2]<<endl;
   return 0;
}
```

مع أطيب الأمنيات بالتوفيق د/السيد سلام

Course Title: Computer Programming (2) برمجة الحاسب (٢) أولي كهرباء Course Code: CCE1204 1st. year
Date: 19-6-2012 Allowed time: 3 hrs No. of Pages: (2)

أجب عن جميع الأسئلة الآتية بلغة سي ++ (C++):

السؤال الأول:

١. اكتب برنامجا لحساب العلاقة التالية:

$$x = 1^r + 2^r + 3^r + 4^r + \ldots\ldots + n^r$$

باستخدام دالة فرعية لحساب قيمة العلاقة السابقة ودالة أخري لطباعة النتائج ، ويتم إدخال عدد الحدود n وكذلك قيمة r بوساطة الدالة الرئيسية.

٢. اكتب برنامجا 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 مستخدما دالة لحساب المجموع والتقدير ودالة أخرى للطباعة علما بأن التقدير يحسب كالتالي :

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

٣. اكتب برنامجا يستخدم الماكرو لإجراء العمليات الحسابية الأساسية الأربعة(الضرب والقسمة والجمع والطرح).

السؤال الثاني:

١. اكتب برنامجا لرسم شكل قطع ناقص يتم إدخال احداثيا مركزه وأنصاف أقطاره عن طريق لوحة المفاتيح ويتقلص القطع الناقص للداخل من الخارج حتى يصير نقطة ، علي أن يكون خط الرسم بلون ازرق(red) والخلفية بلون احمر(Blue) والرسم يكون بخط منقط(dotted).

٢. أكتب برنامجا يقوم بإدخال عناصر مصفوفة ثنائية البعد تتكون من صفين وثلاثة أعمدة ويقوم البرنامج باستبدال عناصر المصفوفة ذات القيم الزوجية بالقيمة ٢٠ ثم اطبع عناصر المصفوفة الجديدة

٣. اكتب عبارات برنامج يطلب من المستخدم إدخال سلسلة حرفية مكونة من عدد من الكلمات ثم يقوم البرنامج بطباعة السلسلة كاملة وعدد أحرفها بدون المسافات بين الكلمات.

Question 3 (20 points)

a) List the steps needed to execute the machine instruction *"add LOCA,R0"* in terms of transfers between the computer system components and simple control signals.

b) For each of the following instructions:

- Load 20(R1), R5
- Move #3000. R5
- Load 30(R1,R2),R5
- Add -(R2).R5

i) Specify the addressing mode

ii) Let registers R1 and R2 contain the decimal values 1200 and 4000. What is the effective address of the memory operand?

c) Consider a 4M bits main memory constructed from SDRAM chips that utilize the burst mode operation.

i) Draw the memory organization, calculating the required number of lines used?

ii) Draw the timing diagram of a read operation with length 4

iii) Calculate the memory bandwidth

Question 4 (20 points)

a) Let A and B two vectors of length n. Their product is defined as $dotprod = \sum_{i=0}^{n-1} A(i) \times B(i)$. Write a program that computes the dot product and stores it in a memory location DOTPROD. The first element of each vector, $A(0)$ and $B(0)$. are stored at memory locations AVEC and BVEC.

b) A block associative-mapped cache consists of 64 blocks. The main memory consists of 4096 blocks, each consisting 128 words.

i) How many bits are there in a main memory address?

ii) How many bits are there in each of the TAG and WORD fields?

c) Write an assembly program that reads one line from a keyboard. stores it in memory buffer, and echoes it back to the display.

With my best wishes,
Dr. Ing. Alsayed Algergawy

Tanta University
Faculty of Engineering
Computers & Control Eng. Dept.
First Year

Computer Architecture
Final Term Exam
June 17, 2012
Time Allowed: 3 Hours

Question 1 (15 points)

Complete the following sentences:

1. The disk system consists of three key parts: ....., ... and .....
2. The ..... refers to any external device connected to a computer.
3. The computer bus consists of three sets of lines used to carry ....., ..., and ..... signals.
4. The address of the instruction to be executed next is hold in the ..... register.
5. A ..... operation on the stack causes the stack pointer to be decremented.
6. The instruction register (IR) is used to .....
7. An example of one-address instruction is ....., while ..... is an example of a zero-address instruction.
8. The N(negative) flag is set to 1 if the result is .....
9. A ..... is the smallest addressable unit in a disk.
10. The register or the memory location that contains the address of an operand is called .....
11. When I/O devices and memory share the same address space, the arrangement is called .....
12. A 16-word of 8 bits each memory chip requires ..... external connections for address, data, and control lines.
13. A 16-bit computer system is capable of addressing up to ..... memory locations.
14. The touchpad is small pad made of ..... material.
15. In the ..... protocol, the cache location and the main memory location are updated simultaneously.

Question 2 (15 points)

Tell whether each of the following statements is true or false, and then correct the false ones:

1. During a cache write operation, if the addressed word is not in the cache, a write miss occurs.
2. The statement **SUM EQU 200** denotes an instruction.
3. The disk drive is the electronic circuitry that controls the operation of the disk system.
4. The top layer of flat structured keyboards is made of rubber, with holes at key positions.
5. The larger the register size, the faster is the speed of the processing.
6. Static RAMs are faster and cheaper than dynamic RAMs.
7. The stack data structure implements Last-In-First-Out concept.
8. Cache memories are usually DRAM.
9. The instruction **INC R1** is an example of immediate addressing.
10. When the processor reads the content of the input buffer, SIN is automatically set to 1.

The third question (20 marks)

A balanced three-phase, negative sequence, Y-connected generator has an impedance of $0.2 + j0.4$ Ω/phase and an internal voltage of 230 V/phase. The generator feeds a balanced three-phase Δ-connected load having an impedance of $88.5 + j115.5$ Ω/phase. The impedance of the line connecting the generator to the load is $0.3 + j1.1$ Ω/phase. *Use the a-phase internal voltage of the generator as the reference.*

(i) **Construct** a single-phase equivalent circuit.

(ii) **Specify** the magnitude and phase angle of the following:

1. The line currents.
2. The phase voltages at the load terminals.
3. The line voltages at the load terminals.
4. The phase currents of the load.
5. The line voltages at the source terminals.

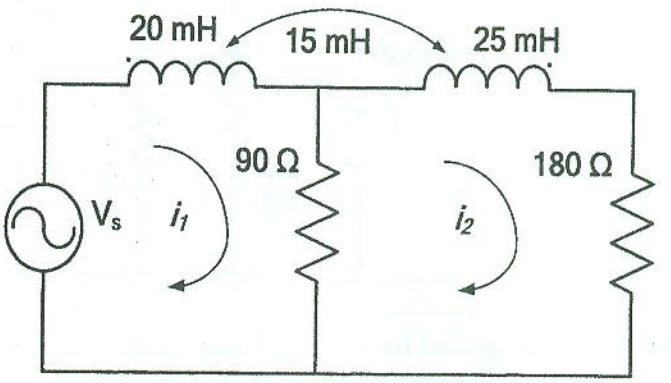
(iii) **Calculate** the total average, reactive and complex power delivered to the load.

(iv) **Calculate** the total complex power delivered by the generator.

The fourth question (15 marks)

The circuit shown has two magnetically coupled coils.

1. **Show** how the polarity marking on the two magnetically coupled coils can be determined experimentally.
2. **Derive** an expression for the mutual inductance between two coils in terms of their self inductances.
3. **Determine** the coefficient of coupling.
4. **What** is the maximum value that the mutual inductance between the two coils can have?
5. **Write** a set of mesh-current equations that describe the circuit in terms of i_1 and i_2.



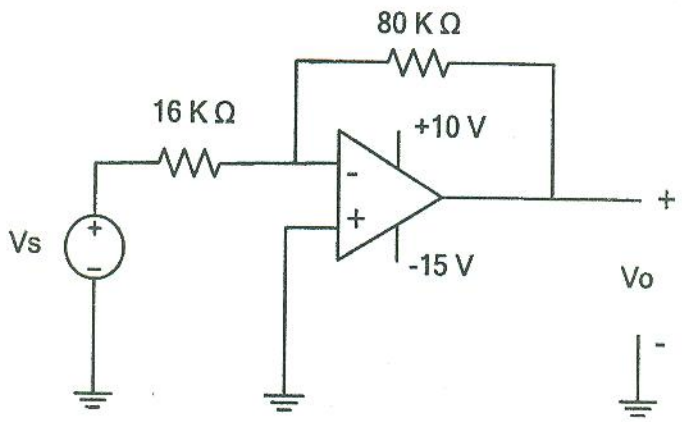
Please Turn Over

The fifth question (15 marks)

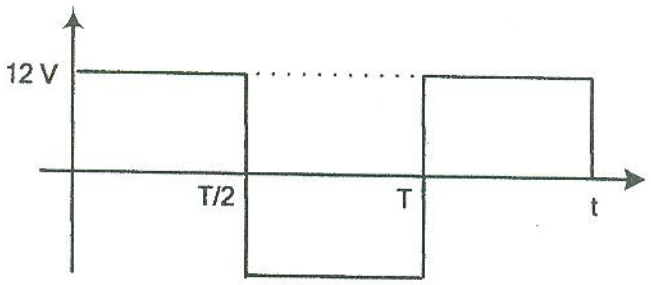
1. **Sketch** a top view of a 741 operational amplifier package with a description for each of its terminals. **(3 marks)**

2. With the aid of a circuit diagram and suitable relations, **show** how an operational amplifier can be used as a difference amplifier. **(3 marks)**

3. The operational amplifier shown in the figure is ideal. **Specify** the range of V_s required to avoid amplifier saturation. **(3 marks)**



4. **Find** the Fourier series spectrum of the voltage waveform shown in figure. **(6 marks)**



Good Luck and best wishes

Prof. Essam Eddin M. Rashad, Dr. Said Allam and exam committee

Final EXAM 2011/2012 - Second Term

Course	Electrical Circuits (2) (EPM1203)	Time Allowed	3 hours
Students	1st Year (Electrical)	Total Mark	85
Date	Wed, June 14th , 2011	Number of pages	3

تعليمات عامة

١. تجنب تماما استخدام اللونين الأحمر والأخضر في إجاباتك.	٢. لا تستخدم سائل التصحيح corrector إلا في أضيق الحدود.
٣. لا يشترط الإجابة بترتيب الأسئلة في ورقة الامتحان.	٤. يراعى قدر المستطاع أن تبدأ إجابة كل سؤال في صفحة جديدة.
٥. اكتب رقم السؤال بوضوح.	٦. أجب بوضوح سواء باللغة الإنجليزية أو العربية.
٧. تجنب قدر المستطاع استخدام القلم الرصاص فيما سوى الرسومات التوضيحية.	

Attempt ALL the following questions and problems:

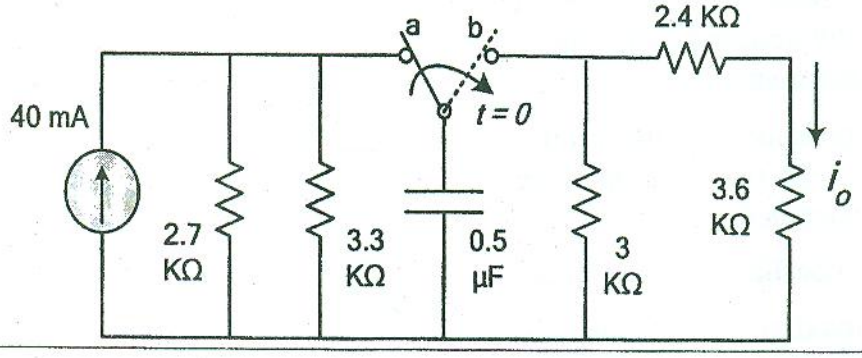
- *Clarify your answer with the suitable sketches of complete data as you can.*
- *Assume any missed data reasonably.*

The first question (15 marks)

The switch in the circuit in the figure has been in position a for a long time. At time t = 0, the switch is moved to position b.

a) Find io (t) for $t \geq 0+$.

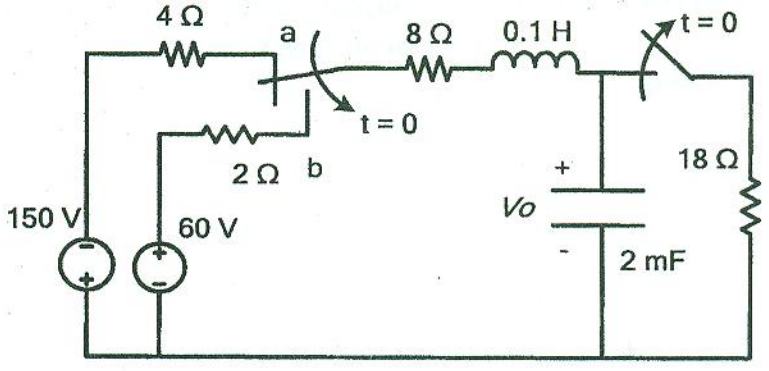
b) What percentage of the initial energy stored in the capacitor is dissipated in the 3 kΩ resistor at time t = 500 μs?



The second question (20 marks)

1. **Explain** ***with suitable relations and sketches*** the effect of resistance on the nature of the response of RLC parallel circuits. **(5 marks)**

2. The two switches in shown figure operate simultaneously. **Find** a time expression for *the voltage across capacitor* for $t \geq 0$ **(15 marks)**



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- قوانين عامة -

■ Fourier Series: $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \left[a_n \cos\left(\frac{n\pi x}{L}\right) + b_n \sin\left(\frac{n\pi x}{L}\right) \right]$

where:

$$a_0 = \frac{1}{L} \int_{-L}^{L} f(x)\,dx$$

$$a_n = \frac{1}{L} \int_{-L}^{L} f(x) \cdot \cos\left(\frac{n\pi x}{L}\right) dx$$

$$b_n = \frac{1}{L} \int_{-L}^{L} f(x) \cdot \sin\left(\frac{n\pi x}{L}\right) dx$$

■ Laplace Transforms:

$$K \xrightarrow{L} K/s \quad , \quad t^n \xrightarrow{L} \frac{n!}{s^{n+1}} \quad , \quad e^{at} \xrightarrow{L} \frac{1}{s-a}$$

$$\sin at \xrightarrow{L} \frac{a}{s^2+a^2} \quad , \quad \cos at \xrightarrow{L} \frac{s}{s^2+a^2} \quad , \quad \sinh(at) \xrightarrow{L} \frac{a}{s^2-a^2}$$

$$\cosh(at) \xrightarrow{L} \frac{s}{s^2-a^2} \quad , \quad t^n \cdot f(t) \xrightarrow{L} (-1)^n \left[F^{(n)}(s) \right]$$

$$e^{at} \cdot f(t) \xrightarrow{L} F(s-a) \quad , \quad \frac{1}{t} f(t) \xrightarrow{L} \int_{s}^{\infty} F(x)\,dx$$

$$F(s) \cdot G(s) \xrightarrow{L^{-1}} \int_{0}^{t} f(x) \cdot g(t-x)\,dx$$

$$y' \xrightarrow{L} sY(s) - y(0) \quad , \quad y'' \xrightarrow{L} s^2 Y(s) - sy(0) - y'(0)$$

مع تمنياتي بالنجاح والتوفيق

د./ تامر السيد عطية

1st year Electrical Engineering Faculty of Engineering Tanta Univ.	امتحان الرياضيات الهندسية للفرقة الأولى كهرباء الفصل الدراسي الثاني ٢٠١١/٢٠١٢ مدة الامتحان (٣) ساعات

Please; answer all the following questions:-

1-a) Obtain the P.D.E whose solution is $U(x,y) = e^x.F(2x-3y) + 3xy^2 - 7$

1-b) Solve the following P.D.Es':

i) $xU_{xy} + U_y = 6y^2 + 6x$

ii) $U_{xx} = y^3e^x + \frac{1}{x} + 6y + 2$

iii) $U_{yy} - 8U_{xy} + 16\,U_{xx} = 0,\ where\ U(x,0) = sin(x),\ U(0,y) = y^2e^{-4y}$

iv) $U_x = 2U_y + U\ ,\ where\ U(x,0) = {}_3e^{-5x} + 2e^{-3x}$

v) $U_{xx} = 9U_{tt}\ where\ U_t(x,0) = sec^2(x),\ U(x,0) = e^{-4x}$

2-a) Find Fourier Series of the following function:

$$f(x) = |cos(x)| + cos(x)\ ,\quad -\pi < x < \pi$$

2-b) If $f(x) = x(\pi - x)\ ,\ 0 < x < \frac{\pi}{2}$ is a periodic function, then prove that

$$x(\pi - x) = \frac{8}{\pi}\left(\frac{sin(x)}{1^3} + \frac{sin(3x)}{3^3} + \frac{sin(5x)}{5^3} + \cdots\right)$$

3-a) Find Laplace transform:

i) $L[t.e^{3t}sin(t) + cosh(2t) + 7(t-1)^3 + 11]$

ii) $L[cos^2(t) + sin(t).sinh(t)]$

3-b) Find Inverse Laplace transform:

i) $L^{-1}\left[\frac{s}{(S-3)^2-1}\right]$ *ii)* $L^{-1}\left[\frac{1}{(s-a)(s-b)}\right]$ *iii)* $L^{-1}[ln(s)]$

3-c) 4) Solve the following O.D.Es using Laplace:

i) $y'' + y = 3\,cos(2t)\ \ ,where\ y(0) = y'(0) = 0$

ii) $y'' + 2y' + 5y = 0\ ,where\ y(0) = 2\ \ and\ \ y'(0) = -4$

Problem number (3) **(30 Marks)**

a) Aided with net sketches, explain the operation theory of electrodynamic instruments used as Wattmeters. (10 points)

b) The gauge factor of a strain gauge transducer is 5.0. If the normal resistance of the strain gauge is 160Ω, find the strain-gauge resistance when subjected to a strain of $5*10^{-3}$ (5 points)

c) Describe the main components of the cathode ray oscilloscope and show how to use it to measure the frequency of a certain wave. (5 points)

d) Explain the theory of operation of the two types of moving iron instruments. (10 points)

Good Luck

Course Examination Committee

Dr. Ahmed Refaat
Dr. Ayman Abd Raboo
Dr. Saeed Allam
Dr. Doaa Mokhtar

Course Title: Electrical Measurements	Course Code: EPM1202	Year: First year
Date: 7/6/ 2012 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

الإمتحان مكون من ٣ أسئلة فى صفحتين

Problem number (1) (30 Marks)

a) Classify the types of measuring errors showing how to reduce each type of these errors. (10 points)

b) The relation between the inertia, the spring constant and the damping constant defines the type of dynamic performance of moving pointer. Discuss this sentence showing the three forms of dynamic performance. (10 points)

c) The arms of a Wheatstone bridge ABCD have the following resistances: AB: $R_1 = 1000\ \Omega \pm 1.0\%$; BC: $R_2 = 100\ \Omega \pm 0.5\%$; CD: unknown resistance Rx; DA: $R_3 = 432.5\ \Omega \pm 0.2\%$. Determine the value of the unknown resistance Rx and its accuracy. (10 points)

Problem number (2) (30 Marks)

a) A permanent magnet moving-coil instrument gives full-scale deflection current of 10 mA. Neglecting the resistance of the instrument, calculate the approximate value of series resistance needed to enable the instrument to measure up to (a) 20 V (b) 100 V (c) 250 V. (10 points)

b) Explain the effect of inserting the DC ammeter and the DC voltmeter on the operation of electric circuits. (10 points)

c) A 100Ω basic movement is to be used as an ohmmeter requiring a full-scale deflection of 1mA and internal battery voltage of 3V. A half scale deflection marking of 2kΩ is desired. Calculate the value of R_1 and R_2. (10 points)