Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Electrical Circuits 2	Course Code: EPM1203	Year: 1st (Electrical Engineering)
Date: June 13th 2010 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

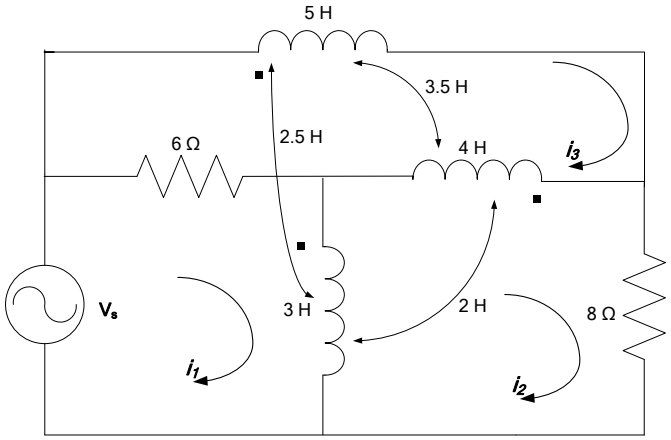
Remarks: (assume any missing data, answers should be supported by sketches if possible)

Problem number (1) (15 Marks)

a) **Show** how the polarity marking on the two magnetically coupled coils can be determined experimentally. (4 Marks)

b) **Using** the stored energy calculation form to **prove that** the mutual inductance between two magnetically coupled coils cannot exceed the root of the product of the self inductances of the two coils. (6 Marks)

c) **Write** a set of mesh-current equations that describe the following circuit in terms of i_1, i_2, i_3.



(5 Marks)

Problem number (2) (30 Marks)

a) A three phase Δ-connected generator has an internal impedance of $0.012+j0.12$ Ω/phase. When the load is removed from the generator, the magnitude of the terminal voltage is 14,300-V. the generator feeds a Δ-connected load through a transmission line with an impedance of $0.03+j0.2$ Ω/phase. The per-phase impedance of the load is $7.5+j4.5$ Ω.

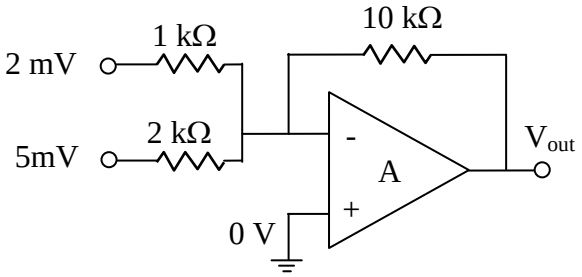
(i) Construct a single-phase equivalent circuit.
(ii) Calculate the magnitude of the line current.
(iii) Calculate the magnitude of the line voltage at the .terminals of the load.
(iv) Calculate the magnitude of the phase current in the load.
(v) Calculate the magnitude of the phase current in the source.

(18 Marks)

b) Prove that the operational amplifier can be used as an integrator and as a differentiator. (4 Marks)

c) Explain the operation theory of the shown circuit. Calculate the output voltage for the given values. Show what is the required modification to double the output voltage for the same input voltages?

(8 Marks)

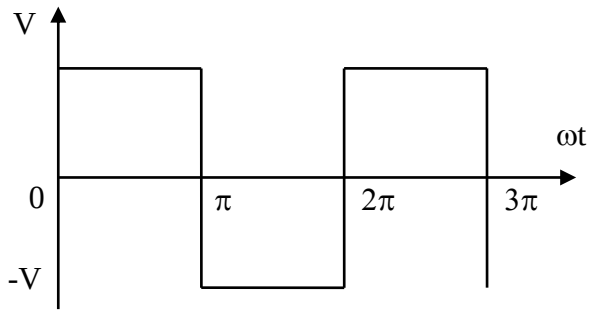


P.T.O.

Problem number (3) **(40 Marks)**

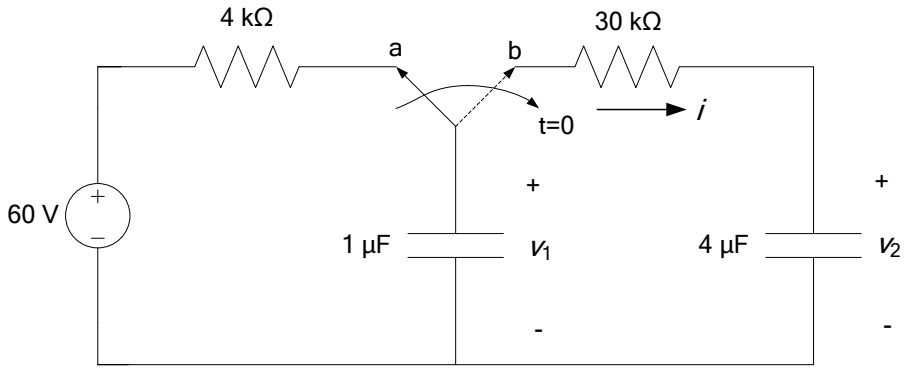
a) Find the trigonometric Fourier series for the square wave shown in the figure. Calculate the average power in terms of "V" when this voltage is applied to a resistive load of 1Ω. Calculate up to the fifth harmonic only.

(12 Marks)

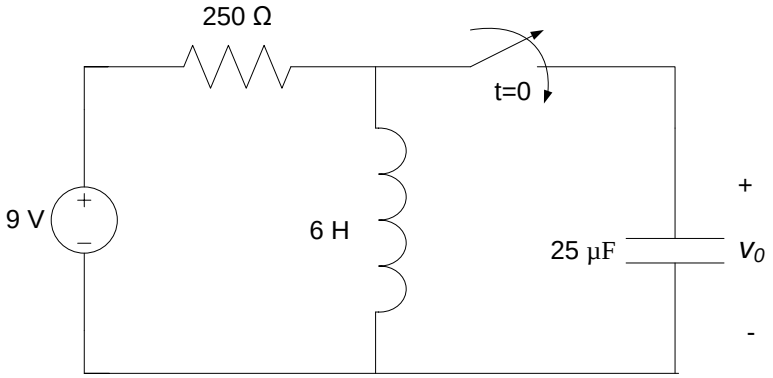


b) The switch in the circuit shown has been in position "a" for along time. At t = 0, the switch is thrown to position b. **calculate** (12 Marks)

(i) i , V_1 , and V_2 for $t \geq 0^+$. **Sketch** the capacitor voltages versus time.
(ii) The energy stored in each capacitor at t = 0.
(iii) The energy trapped in the circuit and the total energy dissipated in the 30 kΩ resistor if the switch remains in position b indefinitely.



c) The switch in the circuit shown has been opened for a long time before closing it at t = 0. **Find** V_0 for $t \geq 0$. (16 Marks)



Good Luck

Course Examination Committee

Dr. Ahmed Refaat Azmy — Dr. Said Mahmoud Allam

Dr. Fayza Safaan — Prof. Anwar Abd El-Latef

Course Coordinator: Prof. Essam Rashad

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Electrical Circuits 2	Course Code: EPM1203	Year: 1st (Electrical Engineering)
Date: June 13th 2010 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (assume any missing data, answers should be supported by sketches if possible)

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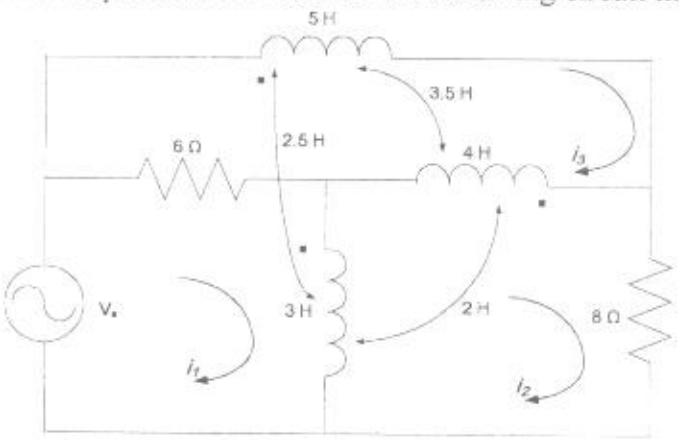

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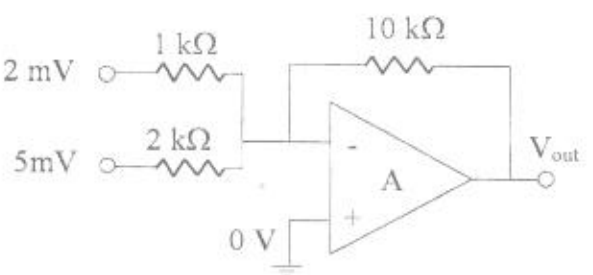

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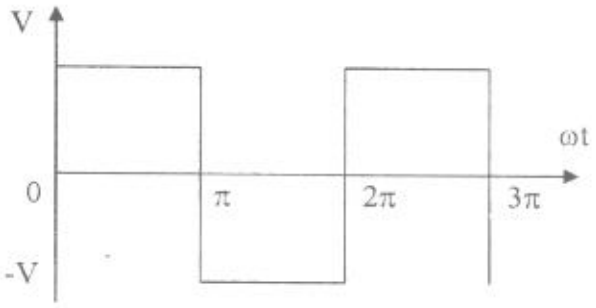

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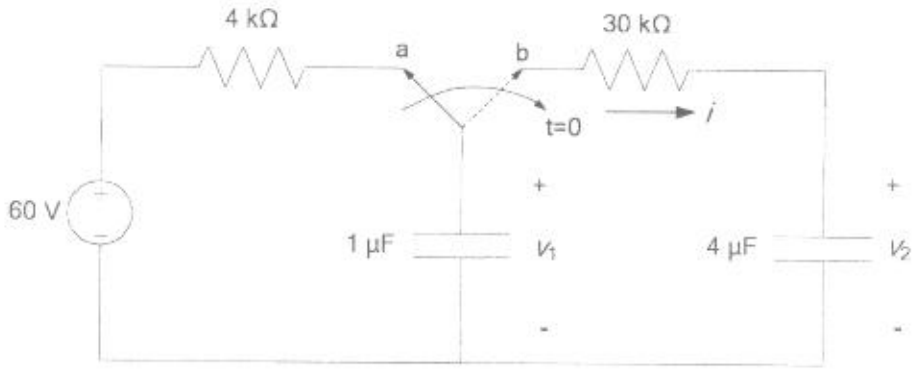

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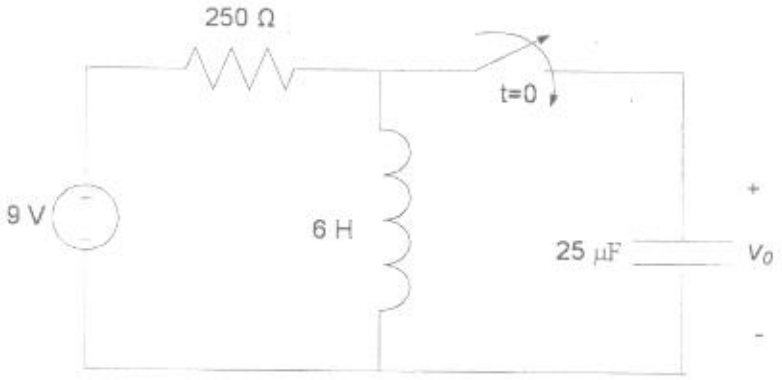

Good Luck

Course Examination Committee
Dr. Ahmed Refaat Azmy
Dr. Said Mahmoud Allam
Dr. Fayza Safaan
Prof. Anwar Abd El-Latef
Course Coordinator: Prof. Essam Rashad

أولى كهرباء

Tanta University	Physics & Mathematics Dept. Total Mark : 85	Faculty of Engineering
Course Title: Engineering Mathematics (2)B	Course Code: PME1201	Year: First Year Electric
Date: 15/6/2010 (Final Second Term Exam)	Allowed time: 3 Hours	No. of Pages: (2)

Answer all the following questions:

Question 1 — 20 Marks

a- Expand the following function in Fourier series

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

b- Find the Fourier series of the function

$f(x) = x(\pi - x), \quad 0 < x < \frac{\pi}{2}$ such that $f(-x) = -f(x)$ and $f(x+\pi) = -f(x)$

Then find the sum of the series:

i) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(2n-1)^3}$ ii) $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^6}$

c- By using the exponential form of Fourier series prove that the expansion of the function

$f(x) = \cosh x, \quad -\pi < x < \pi$ is given by $\sum_{-\infty}^{\infty} \frac{(-1)^n \sinh \pi}{\pi(1+n^2)} e^{inx}$

Question 2 — 23 Mark

a- Solve the following O.D.E. using Laplace Transform

$$y''(t) + 9y(t) = \cos 2t, \qquad y(0) = 1 \text{ and } y(\frac{\pi}{2}) = -1$$

b- Solve the following system of O.D.E.s using Laplace Transform

$$x''(t) + y'(t) + 3x(t) = 15e^{-t} \qquad \text{and} \qquad y''(t) - 4x'(t) + y(t) = 15\sin 2t$$

Subject to $x(0) = 35$, $x'(0) = -48$, $y(0) = 27$ and $y'(0) = -55$

c- Solve the following integro-differential equation using Laplace Transform

$$y'(t) + 5\int_0^t \cos 2(t-u)y(u)du = 10 \ , \quad \text{given } y(0)=2$$

Question 3 — 22 Mark

a- Obtain the P.D.E whose solution is $U(x,y) = F(2x - 3iy) + G(y)$

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

i) $U_{yy} = \frac{y.\sinh(y)}{x+1} + \frac{1}{y} + 2$

ii) $U_{xx} + U_{yy} = 0$

iii) $U_{xx} = U_{tt}$, where $U(x,0) = 0,\ U_t(x,0) = \frac{1}{1+x^2}$

iv) $U_{xx} = U_{tt}$, where $U(x,0) = 0,\ U_t(x,0) = 2\sinh(4\pi x)$

$U(0,t) = U(3,t) = 0,\ 0 \le x \le 3,\ t \ge 0$

Question 4 — 20 Mark

a- Solve the following system of O.D.Es: $X' = \begin{pmatrix} 2 & -1 \\ -2 & 1 \end{pmatrix} X + \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

b- Discuss the convergence of the following infinite series:

i) $\sum_2^\infty \frac{1}{n.[ln(n)]^{1.1}}$

ii) $\sum_1^\infty \frac{5n}{n^3+2}$

iii) $\sum_1^\infty \frac{5^n.n!}{n^n}$

Course Examination Committee

Dr. Faheem Abd-Elahameed **Dr. Tamer El-Sayed**

Tanta University

Electrical Power and Machines Engineering Department

Faculty of Engineering

Course Title: Electrical Measurements	**Course Code :** EPM1202
Year : 1st Elect.	**Allowed time:** 3 hrs.
Exam : Final	**Date** : 17/06/ 2010
Maximum Marks 90	No. of Pages: 3

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

Question(1) (a = 6 Marks, b = 6 Marks, c = 6 Marks)

a) Aided with clear sketches whenever possible, define the following terms:

i. Substitution method

ii. Nominal value

iii. Precision

b) A 500 V voltmeter is specified to be accurate within ± 1% at full scale. Calculate the limiting error when it is used to measure a 150 V and 50 V.

c) Two different readings were obtained for a resistor. The tolerance for both readings are ± 0.2 Ω. Measurement 1 is 204.5 Ω and measurement 2 is 204.8 Ω .
Find a closer range for the true value of the resistor.

Question(2) (a = 6 Marks, b = 12 Marks)

a) Write down the dynamic equation of a pointer measuring instrument. Give the definition of each term used and sketch the dynamic response.

b) A series type Ohmmeter has an internal resistance of 100 Ω and a full-scale deflecting current of 1 mA. The battery output voltage is 6 V. The value of the resistance of half-scale deflection is 5000 Ω . Calculate:

i) The value of the zero adjustment resistor R_2 and limiting resistor R_1 .
ii) Maximum value of the zero adjustment resistor R_2 to compensate for a 10% drop in battery voltage.

Question(3) (a = 10 Marks, b = 8 Marks)

a) Choose the correct answer:

i. The moving coil of a wattmeter is the
(A) Current coil (B) Power coil (C) Voltage coil (D) Resistance coil

ii. An accurate instrument:
(A) is precise (B) is not precise (C) is sensitive (D) may be precise

P.T.O.

iii. Piezo electric transducer converts:

(A) light to voltage (B) heat to voltage (C) stress to length (D) pressure to voltage

iv. A high temperature sensitive resistance is:

(A) RTD (B) Thermistors (C) Thermocouple (D) Strain gauge

v. CRO:

(A) Displays current wave-form (B) measure rms values

(C) Displays voltage wave-form (D) measure average values

b) A PMMCI having 25 mA full scale current with an internal resistance of 100 Ω is used to construct an ac voltmeter with a voltage range of 200 V_{rms}. Compute the value of the series-limiting resistor for a full-wave bridge rectifier with the forward resistance of each diode to be 100 Ω and the reverse resistance to be infinite.

Question(4) *(a = 6 Marks, b = 12 Marks)*

a) Derive an expression for the gauge factor K of a circular wire strain gauge in terms of Poisson's ratio γ.

b) An ac bridge has the following arms:
Z_1 = 400 Ω ∠-85° in arm AB, Z_2 = 200 Ω ∠0° in arm AC, Z_3 = 300 Ω ∠0° in arm BD, A null detector is connected between terminals B and C and an ac voltage source of 220 V and frequency 50 Hz is connected between terminals A and D.
Determine:

i. The unknown impedance Z_4 in arm DC as a resistance and inductance in series.
ii. The quality factor of the unknown coil?

Question (5) *(a = 6 Marks, b = 12 Marks)*

a) From the points of view of connection diagrams, measuring ranges limitations and balance equation, compare between:

i. Maxwell and Hay bridges

ii. Wheatstone and Kelvin bridges

b) The Graticule of a dual trace oscilloscope is shown in Fig. 1, with two sine waveforms A and B are displayed. The input signal of wave-form A is connected to the scope via a 10X probe with vertical amplifier sensitivity of 2 V/division. The input signal of wave-form B is connected to the scope via a 1X probe with vertical amplifier sensitivity of 10 V/division. The time-base sensitivity is 0.1 μs/division, determine:

i. Peak-to-peak voltage of the two wave-forms A and B.

ii. RMS of the two wave-forms A and B.

iii. Frequency of the two wave-forms A and B.

iv. Phase-shift between the two wave-forms A and B in degrees.

v. Lissajous pattern shown in Fig. 2 is obtained when signal B is disconnected, signal A connected to the input X, time-base is deactivated and a signal of unknown frequency is connected to the input Y with X-Y mode is chosen. Determine unknown frequency.

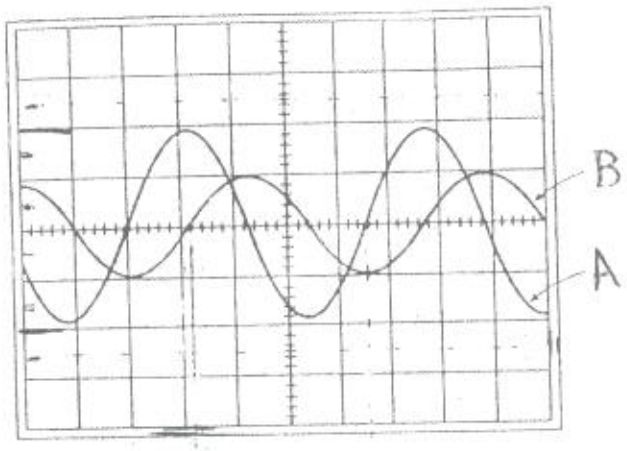

Fig. 1 Two wave-forms A&B

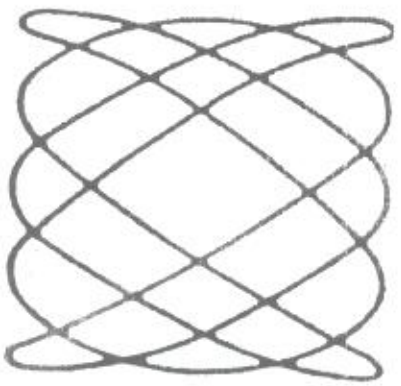

Fig. 2 Lissajous Pattern

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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 2010 (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) (15 Marks)

(a) The circuit shown in **Fig.1** is designed for maximum voltage gain while maintaining Q_1 in the active mode . If $V_A = 10$ V. and $V_{BE} = 0.8$ V, and $V_{CC} = 2.5$ V. Determine the required bias current.

(b) Determine the voltage gain and I/O impedance of the circuit shown in **Fig.2** . Assume $V_A = \infty$.

Question number (2) (15 Marks)

(a) **Fig.3** shows an emitter follower connected with common base . Assume $V_A = \infty$.
(i) Calculate I/O impedance of the circuit
(ii) Calculate the voltage gain of the circuit.

(b) In **Fig.4** ,If W/L = 10/0.18 and $\lambda = 0$. Determine the value of I_D.
($V_{TH} = 0.4$ V, $\mu_p C_{ox} = 100\mu A/V^2$)

Question number (3) (20 Marks)

(a) The common gate circuit of **Fig.5** is designed to provide a voltage gain of 4 and an input impedance of 50 Ω . If $I_D = 0.5$ mA and $\lambda = 0$, Determine the value of R_D and W/L.
($V_{TH} = 0.4$ V, $\mu_n C_{ox} = 200\mu A/V^2$)

(b) Assume in **Fig.5**, $I_D = 0.5$ mA and $\lambda = 0$, and $V_b = 1$V. Determine the value of R_D and W/L for an input impedance of 50 Ω and maximum voltage gain (while M1 remains in saturation).

Question number (4) (20 Marks)

(a) (i) Explain the difference between SCR and a LASCR
(ii) Sketch the circuit diagram of SCR phase controller and explain its operation

(b) The SCR in **Fig. 6** has a holding current of 100 mA, a maximum gate trigger voltage of 0.75 V, and a maximum gate trigger current of 10 mA.
(i) Calculate the maximum value of V_{in} that will cause the SCR to break down.
(ii) If V_{in} is zero , calculate the value to which V_{AA} must be reduced to turn the SCR off
(Assume when the SCR turns on , the anode voltage will drop to a low voltage of 2V)

Question number (5) (20 Marks)

(a) In the equivalent UJT circuit shown in **Fig.7** , $R_{B1} = 5$ kΩ , $R_{B2} = 4$ kΩ , $V_{BB} = 18$ V, and $V_{EE} = 5$ V .
(i) Is UJT forward biased
(ii) What value of V_{EE} will cause the UJT to conduct.

(b) Photons with an energy of 2 eV are incident on the photodiode shown in **Fig.8** . If the junction area is 0.5 cm^2, the quantum efficiency is 0.8 , and the light intensity is 6.4 x 10^{-2} W/cm^2. (i) Determine the photocurrent

(ii) If R = 1kΩ , determine the minimum power supply voltage V_{PS} needed to ensure that the diode is reverse biased. (q = $1.6x10^{-19}$ C,)

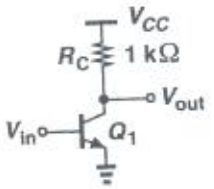


Fig.1

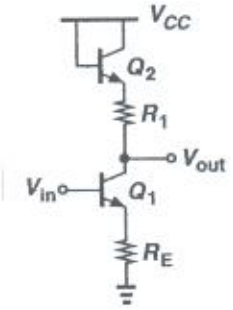


Fig.2

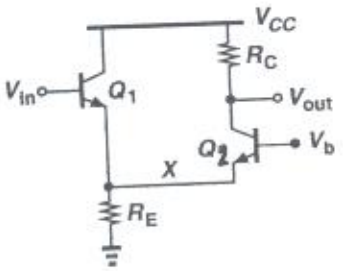


Fig.3

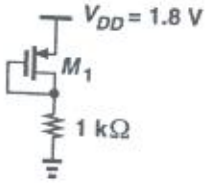


Fig.4

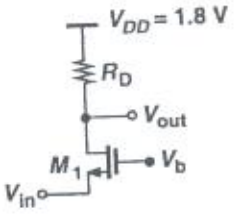


Fig.5

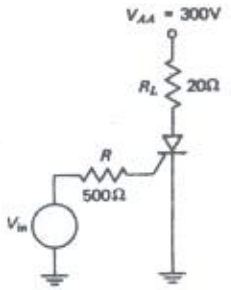


Fig.6

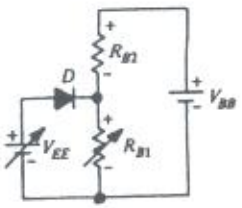


Fig.7

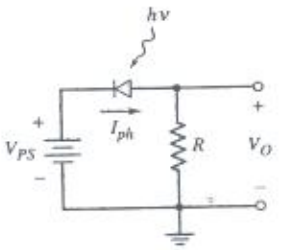


Fig.8

Good Luck

Course Examination Committee

Prof. Mustafa M.Abd Elnaby
Dr. Heba Elkhoby

Course Coordinator: Prof. Mustafa Mahmoud Abd Elnaby

اول كمبيوتر

Tanta University

Department: Computers & Automatic Control Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Computer Hardware Second term 2010	Course Code: CCE1205 Allowed time: 3 hrs	Year: 1st Electrical Eng. No. of Pages: (2)

Remarks: ***Make your answers as neat as possible. Answer briefly and don't write un-needed information.***

Q1. For each of the following statements, state whether it is True or False. Explain if False: ***(30 points)***

1. Instruction Register (IR) contains the address of the next instruction to be executed.
2. The value of NUM1 in the following assembly code (assuming one word per instruction) is 304

```
        ORIGIN   204
N       DATAWORD 100
NUM1
```

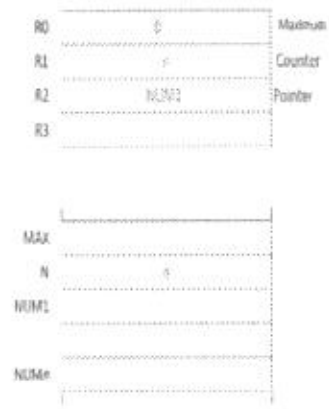
3. The assembly instruction "**INC R1**" is an example of immediate addressing.
4. A pop operation on the stack causes the Stack Pointer (SP) to be incremented.
5. Random Access Memory (RAM) means that access time is different for all memory locations (addresses) .
6. USB interface allows unlimited number of devices to connect to the computer.
7. In USB, each data packet follows a token packet containing the address and endpoint of the device.
8. Cache memories are usually DRAM.
9. Cache replacement algorithms determine how to map a block in cache with another block of main memory.
10. A disk cylinder is the set of tracks that can be accessed without moving the disk arm.
11. Latency time is the time required to move the disk arm to the correct cylinder.
12. Internal fragmentation of a disk is loss of space within a sector or a cluster.
13. Number of cylinders is less than number of tracks in a disk surface.
14. A single file can be stored in more than one extent on the disk.
15. Transfer speed of USB2 is 200 Mbit per second.
16. Flash memory performance is bad on reading.
17. Page Table Base Register contains the number of virtual memory pages in memory.
18. A track is the smallest addressable unit in a disk.
19. In writing to a CD ROM disk, we cannot have two 1's in a row.
20. Disk seek time is typically larger than latency time.
21. Sectors are organized along circular tracks on the surface of a CD ROM disk.
22. File manager uses a file allocation table (FAT) to map logical sectors of the file to the physical clusters.
23. Message of the USB host is copied only to the addressed device and the hub it the devices is connected to.
24. USB has 16 different packet types.
25. All devices connected to a USB hub must have the same speed.
26. The video adapter determines the display's maximum resolution.
27. Dots-per-inch (dpi) is a measure of display resolution.
28. A plotter is an input device.
29. Liquid Crystal Displays (LCD) are matrix addressable.
30. Input is any data or instructions entered into the computer's memory.

Q2. ***(22 points)***

a. If register R0 contains the binary value 11001101 and the carry bit C contains 0, what will be the value stored in R0 and C after each of the following instructions:
   i. ADD #9, R0
   ii. RotateL #3, R0
   iii. RotateLC #3, R0
   iv. AShiftR #2, R0

b.

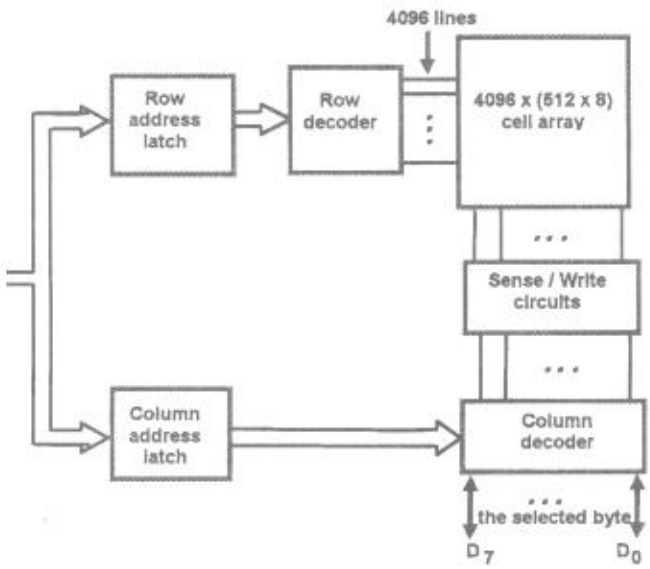
The figure shown is the memory organization for a list of n numbers stored in memory locations starting from location NUM1. It is required to **compare** them and store the **maximum number** in memory location MAX. Memory location N contains how many numbers to be compared (n numbers).
Write an assembly program to compare the n numbers using indirect addressing and store their maximum number in location MAX. Use R0 as the temporary maximum number storage, R1 as the counter and R2 as the indirect addressing pointer.



Q3. ***(18 points)***

The figure shows internal organization of a 2M x 8 dynamic memory chip. Some signals are not shown in the diagram. **Redraw** the diagram. Then:

i. Add the following signals to the diagram: CAS, RAS, CS, R/W, number of bits used for row address, and number of bits used for column address.
ii. Explain ***briefly*** the function of the $\overline{RAS}$, CAS, CS, R/W signals.
iii. Explain ***briefly*** the function of the row address latch and the row decoder.
iv. How refreshing is implemented in SDRAM? Discuss the overhead caused by refreshing on memory performance.



GOOD LUCK

Course Examination Committee

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Tanta University
Faculty of Engineering
Computer and Aut. Control Eng. Dep.
First Year

Computer Programming (C++)
Second Term – Final Exam
Time allowed: 3 Hrs.
June 24, 2010

(Pages: 2 – Questions: 3 – Marks: 60)

Attempt the Following Questions:

Question 1: $20^o = (16^o + 4^o)$

1) Consider the class ***Employee*** that stores employee's first name and last name. This information is common to all employees including those in classes derived from class ***Employee.*** From class ***Employee*** derive classes ***HourlyWorker*** and ***PieceWorker***. The ***HourlyWorker*** gets paid for any over time hour with rate equivalent to the rate of one hour and half. The overtime hours are the excess of 40 hours per week. The ***PieceWorker*** gets paid a fixed rate per item produced. For simplicity, assume this person makes *N* different items and the rate per item is *R*, then the class computes *N* * *R*.

2) Consider the following:

```
class B {
private:
        int y, z;
public:
        void set(int a, int b);
                }
```

Write the definition for the method set that assigns the inputs a and b to B's data members.

Question 2: $20^o = (16^o + 4^o)$

1) Create a class called ***Complex*** for performing arithmetic with complex numbers and write a program to test your class.

Complex numbers have the form *realpart + imaginarypart * i*

Where ***i*** is $\sqrt{-1}$

Use floating-point variables to represent the private data of the class. Provide a constructor function that enables an object of that class to be initialized when it is declared. The constructor should contain default values in case of no initialization. Provide public member function for each of the following case:

a) Addition of two ***Complex*** numbers: the real parts are added together and the imaginary parts are added together.

b) Subtraction of two ***Complex*** numbers: the real part of the right operand is subtracted from the real part of the left operand and the right part of the imaginary operand is subtracted from the left part of the imaginary operand.

c) Printing ***Complex*** numbers in the form (*a, b*) where *a* is the real part and *b* is the imaginary part.

2) Explain the difference between the keywords *struct* and *class*.

Question 3: $20^{o} = (16^{o} + 4^{o})$

1) Write a class ***Time*** with constructor and destructor. It can initialize its private members *hour*, *minute*, and *second* to 0. The class ***Time*** includes the following methods:

   a) **setTime**: to set the values of hour, minute, and second variables.

   b) **PrintMilitary**: to print the time in military format.

   c) **PrintStandard**: to print time in standard format.

   The constructor of this class should ensure that the value supplied for *hour* is in the range 0 to 23, and that the values for *minute* and *second* are each in the range 0 to 59.

   Note that:

   - If the time is 10:32.22 morning, then the military time format is (10:32.22) and the standard time format is (10:32.22 am).
   - If the time is 02:04.36 afternoon, then the military time format is (14:04.36) and the standard time format is (02:04.36 pm).

2) Find the error(s) in the following class and show how you can correct it.

```
class A {
private:
        int x = 0;
        int y = 0;
public:
        void double set(int, int);
        }
```

Good Luck

Dr. Tarek El.Ahmady El.Tobely