Tanta University

Department: Engineering Physics and Mathematics
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Engineering Mathematics(2B)	Course Code: PME1106	Year: 1st Electrical Eng.
Date: June. 3 rd 2015 (Second Term)	Allowed time: 3 Hrs	No. of Pages: (2)

Remarks: Answer All of The Following Questions

Question Number 1 (20 Marks)

1-) Plot the function $f(x) = \begin{cases} 0 & , \ -\pi<x<0, \\ \frac{x}{2} & , \ 0<x<\pi \end{cases}$, where $f(x+2\pi) = f(x)$ and then find its corresponding Fourier series. Using this series, show that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{7^2} + \cdots$ (10 Marks)

2-) For the function $f(x) = e^{2x}$, $0 < x < 1$ (10 Marks)

i-) Find the Fourier sine series ii-) Find the Fourier cosine series

Question Number 2 (25 Marks)

1-) Find Laplace transform of the functions:

i-) $f(t) = \begin{cases} 0 & , \ 0 \le t < 4 \\ t^2 & , \ t \gg 4. \end{cases}$ ii-) $f(t) = sin^2 t.$ (8 Marks)

2-) Find the Inverse Laplace Transform for the following:

i-) $F(s) = 2s - 1/(s^3 - s).$ ii-) $F(s) = e^{-3s}/s^3.$ (10 Marks)

3-) Solve the O.D.E. using Laplace Transform : $y' - 2y = 5e^{2t}$, $y(0) = 1.$ (7 Marks)

PART TWO (40 MARKS)

Question Number (3) (20 Marks)

1-) The propagation of the controlled electric field (E) in an electric conductive medium with electric conductivity $\sigma \ge 0$, the vacuum of the permeability $\mu_0 = 4\pi x 10^{-7}\ H/m$, the speed of light $c = 3x10^8\ m/s$, $\alpha = c\sigma\mu_0$ and an arbitrary controlling constant β is considered according to the controlled Telegrapher's equation,

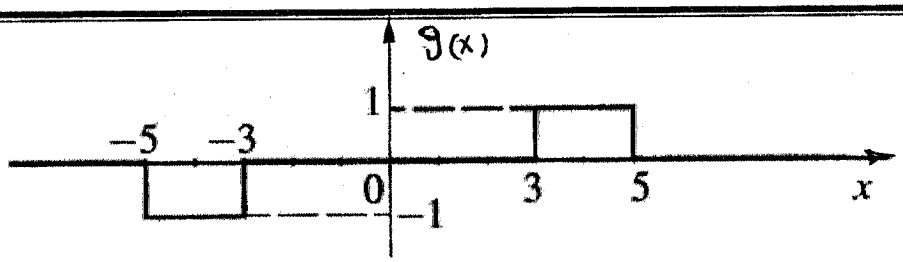
$$\frac{\partial^2 E}{\partial t^2} + \alpha \frac{\partial E}{\partial t} + \beta E = \frac{\partial^2 E}{\partial x^2}$$

a-) If the electric field propagated in the wave form $f(x + \lambda t) = e^{x+\lambda t}$ with speed λ. Expect the value of β in terms of α to get a propagated wave possessing a property of

i-) damped propagation. ii-) fixed propagation. iii-) grown propagation. (5 Marks)

b-) If $\beta = 0$, sketch the D' Alembert graphical solution at the instants t = 0, 1, 2, 3, 4, 5 seconds in an insulated medium ($\sigma = 0$) under the initial conditions $E(x, 0) = 0$ and $E_t(x, 0) = g(x)$ which represented by the following graph: (5 Marks)

P.T.O



2-) The electric potential $u(x,y)$ in the semi-infinite strip $x > 0, \quad 0 < y < a$ satisfies the Laplace equation $u_{xx} + u_{yy} = 0$. Find the potential in the strip if $u(x,y)$ is finite throughout the strip and it satisfies the boundary conditions on the top and bottom of the strip $u_y(x,0) = u_y(x,a) = 0$ corresponding to insulator sides of the strip, and the potential

$$u(0,y) = \begin{cases} 1 & 0 \le y \le \frac{a}{2} \\ 0 & \frac{a}{2} < y \le a \end{cases}$$

at $x = 0$ on the y-axis at the end of the strip. (10 Marks)

Question Number (4) (20 Marks)

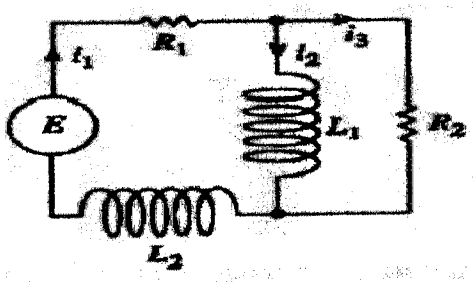
1-) Examine the stability of solutions for the following O.D.Es:

i-) $\frac{dX}{dt} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} X.$ ii-) $\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 9x = 0.$ (5 Marks)

2-) The system of differential equations for the currents $i_1(t)$ and $i_2(t)$ in the electrical network shown in the following figure is

$$\frac{d}{dt}\begin{pmatrix} i_1 \\ i_2 \end{pmatrix} = \begin{pmatrix} -(R_1 + R_2)/L_2 & R_2/L_2 \\ R_2/L_1 & -R_2/L_1 \end{pmatrix}\begin{pmatrix} i_1 \\ i_2 \end{pmatrix} + \begin{pmatrix} E/L_2 \\ 0 \end{pmatrix}$$

Does the system have a periodic solution for the following values $R_1 = 8\,\Omega$, $R_2 = 3\,\Omega$, $L_1 = 1\ H$, $L_2 = 1\ H$, $i_1(0) = 0$, $i_2(0) = 0$ *and* $E = 10 \sin t\ V$? If so, Is there more than one periodic solution? (5 Marks)



3-) Test the convergence of the infinite series $\sum_{n=1}^{\infty} \frac{tan^{-1} n}{n^2+1}$. (5 Marks)

4-) Examine the conditional and absolute convergence for the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}\, 3^n}{(2n-1)^n}$. (5 Marks)

With Best Wishes

Course Examination Committee and Course Coordinators

Dr. Eng. Mohamed Elborhamy **Dr. Eng. Yaser Gamiel**

Tanta University

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

Faculty of Engineering

Course Title: Electrical Measurements	Course Code: EPM1202	Year: First year
Date: 6/6/ 2015 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

الإمتحان مكون من 3 أسئلة فى صفحتين

Answer the following questions

Problem number (1) (36 Marks)

a) Explain how you can reduce the effect of limiting errors and random errors. Support your answer with suitable examples. **(9 points)**

b) The deflecting torque of an ammeter depends on the current according to the following relation: $T = k\,(I)^{1.5}$, where k is a constant. If a current of 10 A produces a deflection angle of 80°, find the current required to produce a deflecting angle of 50°. Assume that the instrument has a gravity control with a torque proportional to the sin of the deflecting angle. Repeat the solution for a spring control. **(9 points)**

c) Explain the meaning of substitution method of measurement. What is the main disadvantage of this method? **(9 points)**

d) Write the equation of motion of moving pointer instruments in the transient period and describe each term in the equation. **(9 points)**

Problem number (2) (27 Marks)

a) A three-section Ayrton shunt is used with a meter that has an internal resistance of 100 Ω and a full-scale deflection of 1 mA to provide three ranges of 50 mA, 500 mA and 5 A. This arrangement is used to measure the current, with minimum limiting error, in a 25 Ω load when the supply voltage is 10 V, calculate the percentage error due to the ammeter insertion. **(9 points)**

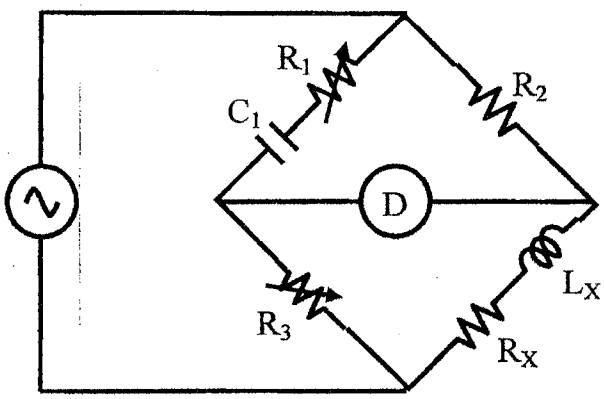
b) A PMMC meter having an internal resistance of 10 Ω is used as a series ohmmeter with a full-scale deflection of 100 μA and an internal battery voltage of 3V. The ohmmeter is designed for a half scale deflection of 5 kΩ. Calculate the values of ohmmeter resistances, i.e., R_1 and R_2. **(9 points)**

c) Explain the two-Wattmeter method to measure the power in three-phase systems. **(9 points)**

Problem number (3) (27 Marks)

a) Compare between moving-coil, moving-iron and moving-coil rectifier instruments. **(9 points)**

b) Derive the balance equations of the shown bridge. If $R_2 = 200\ \Omega$, $C_1 = 4000$ nF and the balance takes place when $R_1 = 600\ \Omega$ and $R_3 = 1000\ \Omega$ at a supply frequency of 50 Hz, find the unknown inductance and resistance. The unknown impedance is replaced with a new one with a resistance of 150 Ω. After replacing the impedance, the balance is restored by modifying the frequency, while the other impedances are maintained fixed. What are the supply frequency and the new value of the unknown inductance? **(9 points)**



c) Discuss in detail the use of potentiometer to measure the velocity and acceleration. **(4 points)**

d) Added with net sketches, show how you can illustrate a current wave on the cathode ray oscilloscope. Also, show how you can define the wave frequency. **(5 points)**

Good Luck

Course Examination Committee

Dr. Ahmed Refaat Dr. Saeed Allam

Dr. Diaa El-Din Mansour

TANTA UNIVERSITY

Electrical Power and Machines Department

Faculty of Engineering

Final EXAM 2014/2015- Second Term

Course	Electrical Circuits (2) (EPM1203)	Time Allowed	3 hours
Students	1st Year (Electrical)	Total Marks	85
Date	Wed,June10, 2015	Number of pages	3

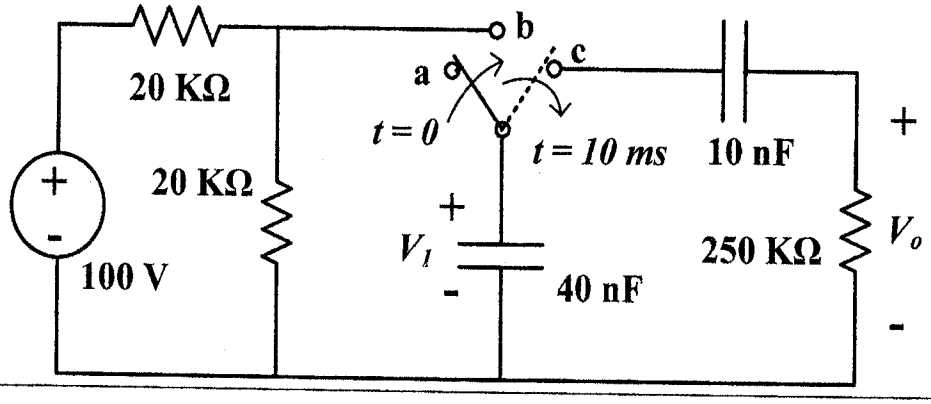
تعليمات عامة	١. تجنب قدر المستطاع استخدام القلم الرصاص فيما سوى الرسومات.
٢. اكتب رقم السؤال بوضوح.	٣. تجنب تماما استخدام اللونين الأحمر والأخضر في إجاباتك.
٤. لا تستخدم سائل التصحيح corrector	٥. يراعى قدر المستطاع أن تبدأ إجابة كل سؤال في صفحة جديدة.
٦. لا يشترط الإجابة بترتيب الأسئلة في ورقة الامتحان.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

Answer ALL the following FIVE questions and problems:

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

The first question (12 marks)

The switch in the circuit shown in figure has been in position "a" for a long time while initial charge on both capacitors was zero. At $t = 0$, the switch has been moved to position "b". After a time of 10 ms, it has been moved to position "c". **Find and plot** time expressions for v_o **and** v_1



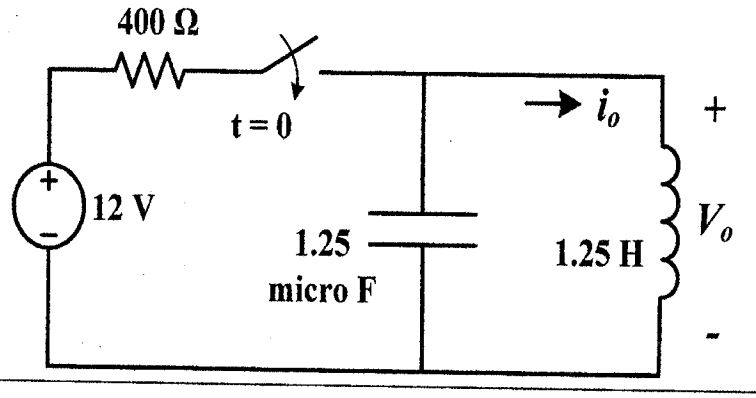
The second question (16 marks)

1. With suitable relations and illustrations **compare** between **the effect of resistance R on the step-response of parallel and series RLC circuits.(4 marks)**

2. In the circuit in figure, there was no stored energy when the switch is closed at time t=0.

Find time expressions of both v_o **and** i_o for $t \geq 0$

(12 marks)



PLEASE TURN OVER

The third question (20 marks)

a) The magnitude of the phase voltage of an **ideal balanced** three-phase Y-connected (***four-wire***) source is **240 V**. The source is connected to a balanced Y- connected load by a distribution line that has impedance of **0.4+*j*1.5 Ω/phase**. The per-phase impedance of the load is **21.6+*j*4.5 Ω**. The phase sequence of the source is **acb**. Use the a-phase voltage of the source as the reference.**(9 Marks)**

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

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

1. The **four** line-currents
2. The **three** line-voltages at the terminals of the source
3. The **three** line-voltages at the terminals of the load

(iii) **Calculate** the total instantaneous power delivered by the generator.

b) Two balanced Δ-connected loads, with impedances **20∠-60 Ω** and **18∠45 Ω**, respectively, are connected to a three-phase system for which a line voltage is $\mathbf{V_{BC}}$**= 212∠0 V**. **(11 Marks)**

(i) **Obtain** the per-phase average, reactive and complex power of each load.

(ii) **Specify** the magnitude and phase-angle of the three line currents I_{aA}, I_{bB} and I_{cC}.

(iii) **Compute** the total delivered power, and **compare** with the sum of the phases power

The fourth question (18 marks)

a) **Two magnetically-coupled coils have self-inductances L_1 = 50 mH and L_2 = 200 mH, and a coefficient of coupling k = 0.5.If coil 2 has 1000 turns, and i_1 = 5.0 sin 400t (A),** **(5 Marks)**

(i) **Find** the induced voltage at coil 2 and the flux of coil 1, Φ_1.

(ii) **Determine** the number of turns of the first coil. (Assume that the physical structure of these coupled coils is such that the P_{11} and P_{22} are equal).

(iii) **What** is the value of P_1 and P_2?

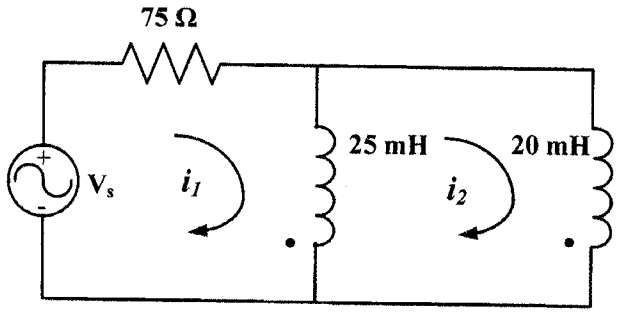
b) **The circuit shown has two magnetically-coupled coils with a maximum coefficient of coupling.** **(10 Marks)**

(i) **Determine** the mutual inductance between the two magnetically-coupled coils.

(ii) **Write** a set of mesh-current equations that describe the circuit in terms of i_1 ***and*** i_2 (in both time and frequency domain).

(iii) **Simplify** the parallel branches, containing 25 mH and 20 mH coils, to a single equivalent coil.

(iv) **Starting with** the stored energy calculation form, **derive** an expression of the maximum mutual inductance between two magnetically-coupled coils.



c) **Show** how the polarity marking on the two magnetically-coupled coils can be determined **experimentally**. **(3 Marks)**

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The fifth question (20 marks)

1. **Sketch** with sufficient details the input-output characteristics of operational amplifier.

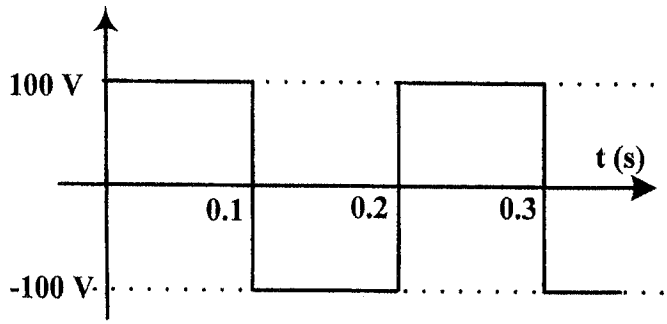
(3 marks)

2. With the aid of **a circuit diagram** and **suitable relations**, **explain** how an operational amplifier can be used to get difference between two signals. Clarify how to achieve *unity scaling factors*.

(4 marks)

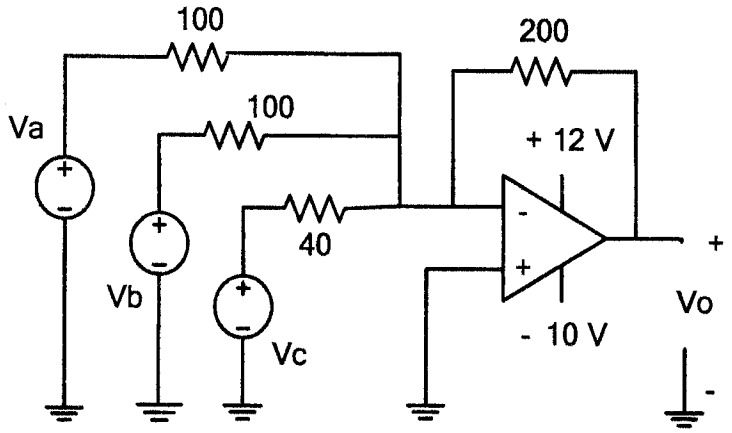
3. The shown voltage waveform represents the input to an integrating amplifier. The positive power supply terminal is connected to +15 V, while the negative terminal is connected to -10 V. Sketch the output voltage waveform.

(4 marks)



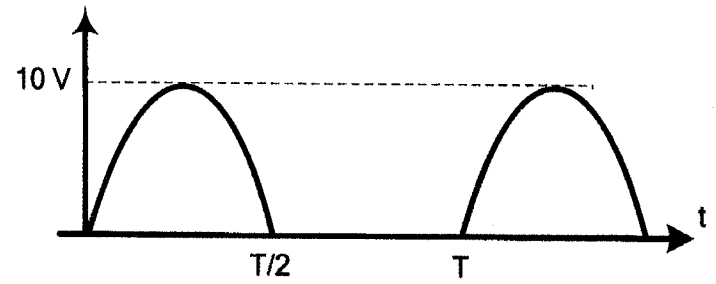
4. The operational amplifier shown in figure is ideal. The values of the shown resistances are in k Ω. **Specify** the range of **Vc** required to avoid amplifier saturation when

Va =3 V and **Vb = 2 V** **.(4 marks)**



5. Find the Fourier series spectrum of the half-wave rectified sinusoidal voltage shown in figure

(5 marks)



Good Luck and best wishes

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

Tanta University

Department: Electronics & Comm. Engineering

Faculty of Engineering

Total Marks: 90 Marks

Course Title: Electronics (2)	Course Code: EEC1202	Year: First Year
Date: June 2015 (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) (25 Marks)

1 (a) Choose the right answer :

1. Small signal analysis shows how a circuit appears to its dc source.
   ( ) ***True*** ( ) ***False***
2. At cutoff , the JFET channel is reverse biased . ( ) ***True*** ( ) ***False***
3. For any amplifier , the lower the resistance of its load, the higher the circuit voltage gain.
   ( ) ***True*** ( ) ***False***
4. In a CE amplifier the input and output current are in phase.
   ( ) ***True*** ( ) ***False***
5. The voltage gain of a CE amplifier equals the ratio of the total ac collector resistance to total ac emitter resistance. ( ) ***True*** ( ) ***False***
6. PUT can be programmed to turn on at a desired anode to gate voltage level .
   ( ) ***True*** ( ) ***False***
7. A load resistance connected to the drain of a common source amplifier reduces the voltage gain. ( ) ***True*** ( ) ***False***
8. The Triac is like a bidirectional SCR.
   ( ) ***True*** ( ) ***False***
9. In the forward blocking region , the SCR is in the off state.
   ( ) ***True*** ( ) ***False***
10. In a phototransistor ,base current is directly proportional to light .
    ( ) ***True*** ( ) ***False***

(b) In Fig.1 , calculate the value of V_B that places Q_1 at the edge of active region. Assume $I_S = 6 \times 10^{-6}$ A , $V_T = 26$ mV and $V_A = \infty$

(c) Determine how the transconductance of a MOSFET (operating in saturation) changes if:
(i) W/L is doubled but I_D remains constant
(ii) $V_{GS} - V_{TH}$ is doubled but I_D remains constant.
(iii) I_D is doubled but W/L remains constant

Question number (2) (20 Marks)

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

(b) Explain and determine the region of operation of M1in each of the circuit shown in Fig.2. Assume $V_{TH} = 0.4$V.

(c) For the circuit shown in Fig.3 , if the drain current = 1 mA, and the voltage gain = 0.8V, Determine R_S , V_{GS} , and W/L. Assume $\mu_n C_{ox} = 100\ \mu A/V^2$, $V_{TH} = 0.5$ V and $V_{DD} = 1.8$V, $\lambda = 0$ and $R_G = 50\ k\Omega$.

PTO

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

(a) Explain the difference between PUT and a UJT

(b) (i) At what anode voltage V_A will each PUT in Fig.4(a ,b) begin to conduct
(ii) Draw the current waveform for each circuit when there is a 10V peak sinusoidal voltage at the anode. Neglect the forward voltage of the PUT.

(c) Describe the Light activated silicon controlled rectifier , show how you can use it to energize a latching relay.

Question number (4) **(25 Marks)**

(a) Derive an expression for the quantum efficiency of a photodetectors. Explain how the power transmission coefficient at the air–semiconductor interface, and the photons absorbed in the active region contribute to the measured photocurrent.

(b) Consider radiation of wavelength $\lambda = 700$ nm incident on a photodetector whose measured responsivity is 0.4A/W. What is its quantum efficiency at this wavelength? If the wavelength is reduced to 500 nm, what is the new quantum efficiency assuming that the responsivity is the same?

(c) If we use a silicon photodetector to detect a light at 700 nm, and refractive index of air (n_{air}) = 1, refractive index of silicon (n_{Si}) = 3.5, determine the refractive index , thickness and the reflection coefficient of the antireflection coating. Comment on your results

Fig.1

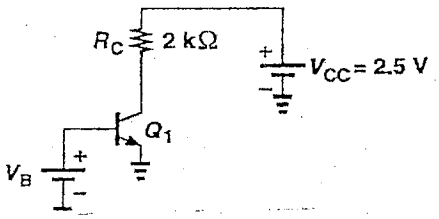
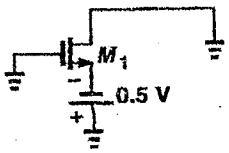
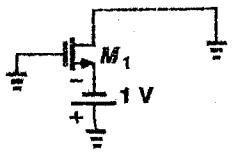


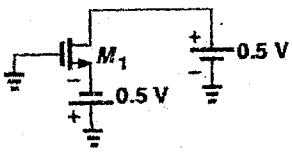
Fig.2



(a)



(b)



(c)

Fig.3

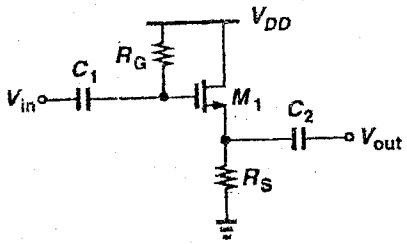
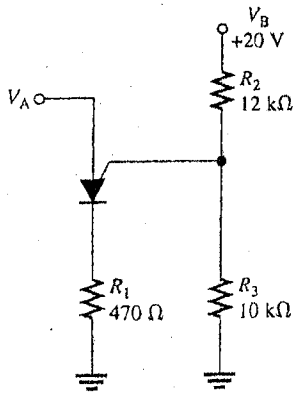
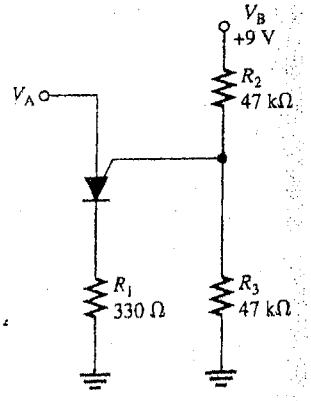


Fig.4



(a)



(b)

Good Luck..... Prof. Mustafa Mahmoud .

Course Title: Computer Hardware	Course Code: CCE1205	Year: 1st
Date: June 13th 2015	Allowed time: 3 hrs	No. of Pages: (4)

ملحوظة: يتم اجابة السؤال الأول والثاني في الورقة المخصصة لهم ولن يتم تصحيح أي اجابة لهم في كراسة الاجابة الأصلية.

Answer the following questions

Question 1 Choose the correct answer (20 pts):

1. Which of the following addressing mode is **lwi $t3,800** using
   a. Immediate
   b. Indirect
   c. Indexed
   d. Direct

2. Dynamic RAM is used as main memory in a computer system as it
   a. Consumes less power
   b. has higher speed
   c. has lower cell density
   d. needs refreshing circuit

3. The main advantages of register addressing mode are
   a. Flexibility and Speed
   b. Speed and number of address bits
   c. Address bits
   d. All of the above

4. What characteristic of RAM memory makes it not suitable for permanent storage
   a. too slow
   b. unreliable
   c. it is volatile
   d. too bulky

5. The circuit used to store one bit of data is known as
   a. Register
   b. Encoder
   c. Decoder
   d. Flip Flop

6. Which of the following is lowest in memory hierarchy
   a. Cache memory
   b. Secondary memory
   c. Registers
   d. RAM

7. Cache memory acts between
   a. CPU and RAM
   b. RAM and ROM
   c. CPU and Hard Disk
   d. None of these

8. The communication between the components in a microcomputer takes place via the address bus and
   a. I/O bus
   b. Data bus
   c. Address bus
   d. Control lines

9. RAM is called DRAM (Dynamic RAM) when
   a. it is always moving around data
   b. it requires periodic refreshing
   c. it can do several things simultaneously
   d. none of the above

10. If multiplexers are used to construct a common bus system for 6 registers of 32 bit each. How many selection inputs of each MUX?
   a. one
   b. two
   c. three
   d. none is correct

11. What is the control unit's function in the CPU?
   a. To transfer data to primary storage
   b. To store program instruction
   c. To perform logic operations
   d. To decode program instruction

12. Which memory unit has lowest access time?
   a. Cache
   b. Registers
   c. Magnetic Disk
   d. Main Memory

13. Cache memory.....
   a. has greater capacity than RAM
   b. is faster to access than CPU Registers
   c. is permanent storage
   d. faster to access than RAM

14. FIFO replacement algorithm is used with ..... mapping function.
   a. Direct
   b. Associative
   c. Set-Associative
   d. None of These

15. In which addressing mode the operand is given explicitly in the instruction
   a. Absolute
   b. Immediate
   c. Indirect
   d. Direct

16. Which of the following instruction is valid MIPS instruction?
   a. lw $t0, $t1($t3)
   b. lw $t0, $t1(4)
   c. lw $t0, 4($t3)
   d. None of These

17. How many 128x8 RAM chips are needed to provide a memory capacity of 2048 bytes?
   a. 2 chips
   b. 4 chips
   c. 8 chips
   d. None of These

18. The line of bus dedicated to move data is.....
   a. Data bus
   b. Control bus
   c. Address bus
   d. None of These

19. ..... is the less expensive type of RAM
   a. DRAM
   b. SRAM
   c. PROM
   d. None of These

20. What is the register that keeps track of the address of next instruction to be executed?
   a. Program Counter
   b. Instruction Register
   c. Memory Address Register
   d. None of These

Question 2 True or False: (10 pts):

1. Operand data can be represented in any order in an instruction ( ).
2. Addressing modes define whether operand values are reside in registers or in memory ( ).
3. In direct addressing mode the operand is given explicitly in the instruction ( ).
4. Write Through technique is used in auxiliary memory for updating the data ( ).
5. A byte is a group of 16 bits ( ).
6. FIFO replacement algorithm is used with direct mapping function ( ).
7. A "word" is the natural unit of organization of memory. Different computer types may have different word lengths (in bits) ( ).
8. The fetch-decode-execute cycle refers to the process by which data is read from the hard drive and stored in memory ( ).
9. A microoperation is an operation performed with the data stored in registers ( ).
10. Address lines indicate which device has permission to use the bus and for what purpose ( ).

Question 3 (20 pts):

1) **What are** the 3 main components of a computer?
2) **Show how** to form 1Mx16 memory module using 512 K X 8 memory chips.
3) **Indicate** the used addressing mode for each of the following instructions:
   - Move R0,R1
   - Add R0,5
   - Move R0, [M[AR]]
   - Add R0, M[AR]
   - Add A
4) **What are** the differences among direct mapping, associative mapping, and set-associative mapping?
5) A set-associative cache consists of 64 lines, or slots, divided into four-line sets. Main memory contains 4K blocks of 128 words each. **Show** the format of main memory addresses.

Question 4 (20 pts)

1) MIPS 32 is a general purpose processor? **What are** the means of 32 and general purpose processor?
2) **State** the used data types in MIPS 32.
3) **Write** an MIPS 32 program for compute area of a circle.
4) **What** is an instruction set? **Can** we use the same instruction set for all processor types?
5) A computer employs RAM chips of 256 x8 and ROM chips of 1024x8. The computer system needs 1K bytes of RAM, 2K bytes of ROM. **Draw** the complete diagram for such system. **Show how** the address is organized.

Good Luck all,

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