

Answer the following questions

QUESTION 1:

- (i) Describe the **RISC** design approach. Describe what happens when you tell the computer's operating system to **load** and run a program.
- (ii) Define **Segments**, **Integer Expressions**, and **Reserved Words** in Assembly. What are the types of reserved words? What is meant by a **Symbolic Constant** and its use? During the assembling process, what happens to symbolic constants that appear within an assembly program? Use three different methods to declare a symbolic constant named **SecondsInDay** and assign it an arithmetic expression that calculates the number of seconds in a 24-hour period.
- (iii) Describe in detail the **Assemble-Link-Execute** cycle.

QUESTION 2:

- (i) What is the purpose of **MOV** and **XCHG** instructions? Summarize the rules associated with them. How can these instructions be used in case of two memory operands?
- (ii) Write, using comments, an assembly language program that copies a **null-terminated string** from one location to another.
- (iii) Write down the values of the destination operand and the Carry, Sign, Zero, and Overflow flags after each instruction has executed in turn: **mov ax, 7FF0h** **add al, 10h** **add ah, 1** **add ax, 2**

QUESTION 3:

- (i) What is meant by a **one-to-many relationship** when comparing a high-level language to assembly language? Implement the following expression in assembly language: $Rval = Xval - (-Yval + Zval)$.
- (ii) Demonstrate the process of subtracting **3** from **4** and show how the **Carry flag** value is produced.
- (iii) Write two different codes to move the *two words* to **EAX** in the following data definition: **list WORD 5678h, 1234h**
- (iv) What is meant by **pointer** and its benefit? What is the purpose of **TYPE** and **TYPDEF** operators?
- (v) Use **indirect** and **indexed** operands to write two different codes to move the array elements in the following data definition to a register: **arrayW WORD 1000h, 2000h, 3000h**
- (vi) What is the purpose of **JMP** instruction? How can it be used to create a loop and how many times will this loop be executed?
- (vii) If **ECX** is initialized to **zero** before beginning a loop, how many times will the **LOOP** instruction repeat?
- (viii) Declare an array of **20** unsigned bytes named **bArray** and initialize all elements to zero.
- (ix) In the **flat segmentation model**, how many bits hold the address of an instruction or variable and which table contains pointers to at least two segments?
- (x) What is the range of addressable memory in **real-address mode**?

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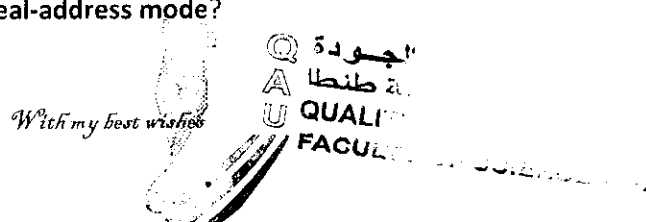
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TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS
EXAMINATION FOR PROSPECTIVE STUDENTS (3RD YEAR) STUDENTS OF COMPUTER
SCIENCE

COURSE TITLE: TOPOLOGY AND ALGABRA

COURSE CODE: MA3125

DATE: 28/12/2017

TERM: FIRST

TOTAL ASSESSMENT MARKS: 100

TIME ALLOWED: 2H

Answer the following questions:

First questions: (40 marks)

- 1- Prove that $\tau = \{\phi, R, H_a = (a, \infty) : a \in R\}$ is a topology on R ? and find closed sets? If $A = (2, 10)$, $B = \{1, 3, 5, \dots\}$ find $A \setminus, A^o, A^b, A^{ext}, \bar{A}, B \setminus, B^o, B^b, B^{ext}, \bar{B}$?
- 2- Prove that the intersection of subrings is a subring? Is the union of a subrings is a subring explain?

Second questions: (30 marks)

- 1- Prove that in a space X $a - (X - A)^o = X - \bar{A}$
b- $\{A^o, A^b, A^{ext}\}$ is a partition on X
- 2- Define and give an example for
 - a- A subbase for the topology
 - b- A neighbourhood system
 - c- A relative topology
 - d- A homeomorphism
 - e- Integral domain
 - f- Ideal

Third questions: (30 marks)

- 1- Define the ring? And prove that $(Z_{10}, +, \times)$ is a ring and find all of subrings?
- 2- Show that if (X, τ) is a topological space and $Y \subseteq X$, then $\tau_y = \{u \cap Y : u \in \tau\}$ is topology on Y ?

EXAMINERS	DR/ MOHAMMED. M. EL-SHARKASY
	DR/ABD-ELFATAH EL-ATIK

With my best wishes



31/12/2017



Attempt all the following Questions

Question No 1:

[35 points]

1. What is the Java source filename extension, and what is the Java bytecode filename extension? What are the input and output of a Java compiler? What are the commands to compile and run a Java program? What is the JVM?
2. What is the output of the following code?

```
public class A {  
    boolean x;  
    public static void main(String[] args) {  
        A a = new A();  
        System.out.println(a.x);  
    }  
}
```

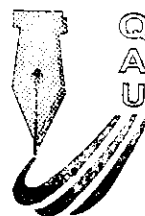
3. Answer the following questions:
 - a. Which of the following is a possible output from invoking **Math.random()**?
323.4, 0.5, 34, 1.0, 0.0, 0.234, 3.16
 - b. How do you generate a random integer i such that $0 \leq i < 20$?
 - c. How do you generate a random integer i such that $10 \leq i < 20$?
 - d. How do you generate a random integer i such that $10 \leq i \leq 50$?
 - e. Write an expression that returns 0 or 1 randomly.

Question No 2:

[40 points]

1. Object-oriented programming uses classes and objects. What are classes and what are objects? What is the relationship between classes and objects?
2. Design a class named **Rectangle** to represent a rectangle. The class contains:
 - a. Two double data fields named **width** and **height** that specify the width and height of the rectangle. The default values are 1 for both **width** and **height**.
 - b. A no-arg constructor that creates a default rectangle.
 - c. A constructor that creates a rectangle with the specified **width** and **height**.
 - d. A method named **getArea()** that returns the area of this rectangle.
 - e. A method named **getPerimeter()** that returns the perimeter.

Write a test program that creates three **Rectangle** objects (**rectangle1**, **rectangle2**, **rectangle3**) — the first object is with default values, the second is with width 4 and height 40 and the third is with width 3.5 and height 35.9. Display the width, height, area, and perimeter of each rectangle in this order. Then modify the object **rectangle2** to have width 5 and height 50.



3. What are the outputs of the following two programs, explain your answer:

```
class A{
protected int a=9;
} // end of class A
class B extends A{
void test(){
int a=22;
System.out.println("a = "+a);
}} // end of class B
public class C{
public static void main(String args[]){
B acc=new B();
acc.test();
}} // end of class C
```

```
class A{
protected int a=9;
} // end of class A
class B extends A{
void test(){
int a=22;
System.out.println("a = "+ this.a);
}} // end of class B
public class CThis{
public static void main(String args[]){
B acc=new B();
acc.test();
}} // end of class C
```

Question No 3:

[35 points]

1. Explain the term polymorphism, Inheritance, Encapsulation, and Abstraction?
2. Consider the following class:

```
public class IdentifyMyParts {
public static int x = 7;
public int y = 3; }
```

- a. What are the class variables and instance variables?
 - b. What is the output from the following code:

```
IdentifyMyParts a = new IdentifyMyParts();
IdentifyMyParts b = new IdentifyMyParts();
a.y = 5; b.y = 6;
a.x = 1; b.x = 2;
System.out.println("a.y = " + a.y + "b.y = " + b.y + "a.x = " + a.x + " b.x = " + b.x);
System.out.println("IdentifyMyParts.x = " + IdentifyMyParts.x);
```
3. Once an array is created, its size cannot be changed. Does the following code resize the array? Explain your answer.

```
int[] myList;
myList = new int[10];
myList = new int[20];
```

Question No 4:

[40 points]

1. What is the meaning of method, static methods, method overloading, and constructor in java? Support your answer by examples? What is the purpose of a constructor in a class?
2. Write a method that returns an array that is the reversal of another array? Write a test program that prompts the user to enter eight numbers, invokes the method to reverse the numbers, and displays the numbers.
3. Answer the following question:
 - a. True or false: When an array is passed to a method, a new array is created and passed to the method.
 - b. What is the difference between, private, protected and public member of the class?
 - c. What are syntax errors (compile errors), runtime errors, and logic errors? Give examples?

EXAMINERS

DR/ RASHA ELAGAMY

PROF. DR./ MOHAMED ELSHARKASY

With my best wishes



TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

Course Title: Mathematical Logic and Boolean algebra.	Third level students of Mathematics	Term: First 2017-2018 Course code MA3113
Date : 4 /1 / 2018	Total marks: 1 0	Time allowed: 2 hrs.

Answer the following questions:

Question 1 (25 marks)

a- Show that neither of the following two formulas tautologically implies the other :

$$(A \leftrightarrow (B \leftrightarrow C)),$$

$$((A \wedge (B \wedge C)) \vee ((\neg A) \wedge ((\neg B) \wedge (\neg C)))) \quad (6 \text{ marks}).$$

b- Find a formula in disjunctive normal form (DNF) that is tautologically equivalent to

$$(A \leftrightarrow B \leftrightarrow C). \quad (6 \text{ marks}).$$

c- Complete the following (in first order languages):

(i) The terms are those expressions that can be built up from and

(ii) An atomic formula is an expression of the form $P t_1 t_2 t_3 \dots t_n$, where P is and t_1, t_2, \dots, t_n are

(iii) The set of wffs is the set of expressions that can be built up from the atomic formulas by

(iv) Let α and β be two atomic formulas. The variable x occurs free in $(\alpha \rightarrow \beta)$ iff, while x occurs free in $\forall v_i \alpha$ iff

(13 marks)

Question 2 (25 marks)

a- Suppose that C is generated from a set $B = \{a, b, c\}$ by the binary operation f and unary operation g . List all elements of C_2 . (11 marks)

b- Rewrite the following formulas in an unabbreviated way that explicitly lists each symbol in order : 1- $\exists x Ax \wedge Bx$. 2- $\exists x (Ax \wedge Bx)$. (7 marks).

c- Assume that we have a language with the following parameters:

\forall : for all things, N : is a number, I : is interesting, $<$: is less than, 0 : a constant symbol to denote zero .

(i) Translate into this language the English sentences:

(a) Zero is less than any number.

(b) Not all numbers are interesting.

P.T.O.

Answer the following questions

QUESTION 1:

- (i) Use the substitution method to verify that $T(n) = 2T(\lfloor n/2 \rfloor) + n = \Omega(n \lg n)$.
- (ii) Draw the recursion tree for the recurrence $T(n) = 4T(n/3) + n$, and provide a tight asymptotic bound on its solution.
- (iii) Use a recursion tree to determine a good asymptotic upper bound on the recurrence $T(n) = T(\lfloor n/3 \rfloor) + T(\lfloor 2n/3 \rfloor) + cn$. Use the substitution method to verify your answer, given the boundary conditions $T(0) = T(1) = 1$.
- (iv) Define a recurrence equation. Try to apply the master theorem to the following recurrences:
- $T(n) = 4T(n/3) + n \lg n$,
 - $T(n) = 4T(n/2) + n^2 \sqrt{n}$.

QUESTION 2:

- (i) Write the INSERTION-SORT procedure to sort into nondecreasing order, then compute its worst-case running time. Give three reasons for concentration on worst-case running time.
- (ii) Outline the three steps involving in the divide-and-conquer paradigm. Use a recurrence equation to describe the running time of this algorithm.
- (iii) Write the MERGE procedure to merge two sorted subarrays into a single sorted subarray and then compute its running time.
- (iv) Define the asymptotic notation Θ for a function and then show that $\frac{1}{2}n^2 - 3n = \Theta(n^2)$.
- (v) Define the ω -notation and then prove that $\frac{n^2}{2} \neq \omega(n^2)$.
- (vi) Define the iterated logarithm function, and then determine the value of $\lg^*(2^{65536})$.