Arab Academy For Science and Technology & Maritime Transport

College of Engineering & Technology

Computer Engineering Department

EXAMINATION PAPER – Final Exam

Course Title: Advanced Programming Langauges

Course Code: CC711

Date: Sat. June, 4-2016   Lecturer: Dr. Manal Helal

Time allowed: 2 Days   Start Time: 10:30 a.m.

Reg.#:   Student's name:

Question #	Marks Available	Actual
Assignments	6	
Concurrency	8	
Functional Programming	8	
Logical Programming	8	
Total	**30**	

Lecturer   Name: Dr. Manal Helal
           Signature:
           Date:

1) Consider the following C program:
```c
int fun(int *i) {
    *i += 5;
    return 4;
}
void main() {
    int x = 3;
    x = x + fun(&x);
}
```

What is the value of x after the assignment statement in main, assuming

a. operands are evaluated left to right.
b. operands are evaluated right to left.

2) Write a C program that has the following statements:

```c
int a, b;
a = 10;
b = a + fun();
printf("With the function call on the right, ");
printf(" b is: %d\n", b);
a = 10;
b = fun() + a;
printf("With the function call on the left, ");
printf(" b is: %d\n", b);
```

and define fun to add 10 to a. Explain the results.

Concurrency	[8 points]

3) Explain clearly why competition synchronization is not a problem in a programming environment that supports coroutines but not concurrency.

4) Write an Ada task to implement general semaphores.

5) The reader-writer problem can be stated as follows: A shared memory location can be concurrently read by any number of tasks, but when a task must write to the shared memory location, it must have exclusive access. Write a C# program for the reader-writer problem.

6) Find definitions of the Scheme functions EVAL and APPLY, and explain their actions.

7) Find at least one example of a typed functional programming language being used to build a commercial system in each of the following areas: database processing, financial modeling, statistical analysis, and bio-informatics.

8) What does the following Scheme function do?

```
(define (x lis)
    (cond
        ((null? lis) 0)
        ((not (list? (car lis)))
            (cond
                (eq? (car lis) #f) (x (cdr lis)))
                (else (+ 1 (x (cdr lis))))))
        (else (+ (x (car lis)) (x (cdr lis))))))
```

9) Write a Scheme function that computes the volume of a sphere, given its radius.

Logical Programming   **[8 points]**

10) Write a Prolog description of your family tree (based only on facts), going back to your grandparents and including all descendants. Be sure to include all relationships.

11) Write a set of rules for family relationships, including all relationships from grandparents through two generations. Now add these to the facts of Problem 10, and eliminate as many of the facts as you can.

12) Using the structures parent(X, Y), male(X), and female(X), write a structure that defines:
a) mother(X, Y).
b) sister(X, Y).

13) Write a Prolog program that finds the maximum of a list of numbers.