

Programming Languages

Midterm Exam
November 14, 2001
(100 pts.)

<i>Last name:</i>	<i>First name:</i>	<i>Social Security:</i>

1. (20 pts.) Define the following three types of storage allocation:
 - (a) static;
 - (b) automatic;
 - (c) dynamic.Elaborate on their differences, drawbacks and advantages.

2. (60 pts.) Consider the following program:

- a) (30 pts.) Write a complete SIMPLESEM code for the following program using the C3 language paradigm. Enter your code and comments in the table provided below. Use pencil so that you can easily make necessary corrections.
- b) (20 pts.) Describe the state of the data segment for the following program right after the execution of the *print* statement in main() . Enter your code and comments in the table provided below . Use pencil so that you can easily make necessary corrections.

```
int a = 1;
int b = 5;
```

```
int f()
{
    int x=0;
    int y = 7;
    x = a--;
    if (x > 0) return ( 3 * x * f() );
    else return 1;
}
```

```
main()
{
    int x=1, y=11;
    a = 2;
    y = b + x;
    print (2*y + f());
```

```
    <-- show data segment after execution of print()
}
```

3. (20 pts.) [PROLOG] Write a Prolog predicate:

subset(List1, List2)

which succeeds only if the list **List1** is a subset of the list **List2**. For example,

subset([2, 3, 2, 4, 5], [6, 7, 2, 2, 5, 6, 3, 4])

should succeed. Do *not* use any built-in predicates except for the predicate **member(Element, List)** and possibly the negation **\+ Predicate**.

SIMPLESEM CODE SEGMENT

Nr.	Code	Comments
0.		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
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37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		

FUNCTION CALL STATEMENTS:

```
set D[1], <ip> + 5           //replace <ip> with real value!  
set D[1] + 1, D[0]  
set D[1] + 2, fp(<n>)       //replace <n> with real value!  
set 0, D[1]  
set 1, D[1] + <size(AR)>    //replace <size(AR)> with real value  
jump <function address>    //replace <function address> with real value
```

FUNCTION EXIT STATEMENTS:

```
set 1, D[0]  
set 0, D[D[0] +1]  
jump D[D[1]]
```

Additional space for your answers (intentionally left empty)

DATA SEGMENT (Initially empty!)

Nr.	Contents	Comments
0)		
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		
11)		
12)		
13)		
14)		
15)		
16)		
17)		
18)		
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37)		
38)		
39)		
40)		
41)		
42)		
43)		
44)		
45)		