

Soft Eng 3M04
Mid-Term I 2003
Dr. Jacques Carette

Name: _____

Student No.: _____

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- This midterm contains 17 questions on four double-sided pages (including this one).
 - This midterm will be marked out of 50.
 - Answer the question in the space provided.
 - Make sure that your name is on all sheets.
 - Do not separate the pages.
 - Make sure that you do not get stuck on one question; use your time wisely.
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1. This course is about being able to put a _____ on software. [1]
2. Which one of these is **not** a goal of this course? [1]
To learn how to develop (large) software products that
 - (a) are reliable
 - (b) can be easily maintained
 - (c) are efficient
 - (d) can be verified
3. Given alphabet $\Gamma = \{a, b\}$ and BNF grammar $(a|bb)?(bab|aaba)^+a^+b^*$, indicate using *true* or *false* if the following strings are in the language defined that grammar. [6]
 - (a) baba
 - (b) babaabaa
 - (c) aaa
 - (d) bbbabb
 - (e) ababab
 - (f) abbabaaabb
4. Over the alphabet $\Gamma = \{w, x, y, z\}$, give the BNF grammar which defines the language which contains the set of all strings that must contain the substring **xxyyzz**, and must end with an **x**. [3]
5. Write out in words what $((a \rightarrow b) \times (int \rightarrow bool)) \text{ seq}$ means. [2]

6. Given the following signature and variable declaration

```
signature TOTO =  
  sig  
    val a1 : unit  
    val a2 : int -> bool  
    val a3 : 'b -> ('a seq)  
    val a4 : int -> 'a  
    val a5 : 'a -> int  
  end  
val a6 : int  
val a7 : bool
```

either give the type of the following expressions or indicate that it is an invalid expression.
[5]

(a) $\lambda x:\text{int}.\text{a2}(x)$

(b) $\text{a4}(\text{a5})$

(c) $\lambda y:\text{char}.\text{a5}(y)$

(d) $\text{a5}(\text{a4}(-3))$

(e) a2

7. Name 4 of the different activities performed during the life cycle of a software product.
Pick 2 of those, and give a 1-2 line explanation of each. [4]

Questions 9-12 and 14 are multiple choice; select *one* response for each question.

9. Who are the stakeholders in a software development project in a corporation: [1]
- (a) Management
 - (b) Anyone who stands to gain or lose from the outcome of the project
 - (c) The Users
 - (d) Buffy and Faith
10. A feasibility study is for [1]
- (a) making sure the project is worth doing
 - (b) making sure the project is possible
 - (c) making sure there is no better solution available
 - (d) all of the above
 - (e) none of the above
11. Suppose that the USES graph for the modules of a system is a DAG (directed acyclic graph) instead of a tree. What would this mean? [1]
- (a) the system is not hierarchical
 - (b) it makes no difference
 - (c) there is some sharing of sub-modules
 - (d) there are some recursive modules
12. What does not belong in a module guide? [1]
- (a) secret
 - (b) service
 - (c) signature
 - (d) rationale
13. Suppose you are developing a system composed of six modules A,B,C,D,E and F, where A USES B, A USES C, C USES D, B USES D, B USES E, E USES F, and C USES F. Define a possible incremental implementation strategy for this system (i.e. in what order would you implement these modules and why). [2]

14. Which of the following would constitute over-design? A design which can deal with a change of [1]

- (a) hardware
- (b) programming language
- (c) virtual machine
- (d) social environment

15. Classify the following specifications or specification style as either operational or descriptive (declarative). [4]

(a) A finite state machine

(b) algebra StackSpec(M:type)

introduces

sorts Stack;

operations

```
create:           -> Stack
empty:   Stack   -> Boolean
push:    M,Stack -> Stack
pop:     Stack   -> Stack
top:     Stack   -> M
```

constrains empty, push, pop, top so that

for all [i:M, s:Stack]

```
empty(create)=true
empty(push(i,s))=false
pop(push(i,s))= s
top(push(i,s))= i
```

end StackSpec

(c) An executable prototype of a system

(d) Let *in* be an input array of length *n*, and *out* an output array.

$\{n > 0\}$

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$\{\forall i : int.(1 \leq i \leq n) \rightarrow out_i = in_{n-i+1}\}$

16. In which of the 3 main modules of a system using an MVC architecture would each of the following be handled: [3]
- (a) handling of data-manipulation commands
 - (b) on-screen representation of the data
 - (c) data storage and data-driven algorithms
17. Suppose you are to head a new project to create all the software for a new cell phone. Give two examples of *secrets* that should be encapsulated in a module because they are most likely to change. Provide some rationale for your choices. [4]