Quiz: Wed, 22 Aug 2018

1. Who is the author of the primary textbook for the class?  
   (a) Sibelius; (b) Sebesta; (c) Sethi; (d) Stansifer; (e) Scott

2. How many students received an ‘F’ from the instructor recently for reasons of academic misconduct?  
   (a) 2; (b) 20; (c) 200; (d) 2,000

3. true / false There will be a short quiz at the beginning of (almost) every class meeting.

4. In a class of 50 computer science seniors, one should expect how many to fail to put their name on the quiz card?  
   (a) 0; (b) 5; (c) 10; (d) 50
1. *Abstraction* means
   (a) signification of words or forms; (b) the medium of expression;
   (c) human-oriented presentation of data; (d) free from convoluted
   interactions; (e) act of determining essential properties.

2. Arabic is to linguistics as:
   (a) expression::visualization; (b) complexity::abstraction;
   (c) Python::programming languages; (d) gender::sex.

3. Software engineers need math because:
   (a) computer operations come from mathematics;
   (b) visualization of data is mathematical; (c) calculus is essential
to calculating; (a) software consists of abstract constructs.

4. true / false   Complexity can be harmful.

5. In the field of programming languages one studies: (a) the
   writings of Guido van Rossum; (b) expressing computation;
   (c) visualization data; (d) the LAMP stack.
1. Which one of the following is not a computational paradigm: (a) logic programming; (b) imperative; (c) categorical; (d) functional.

2. true / false Recursion is a distinguishing characteristic of the computational paradigms.

3. true / false Objects are a distinguishing characteristic of the computational paradigms.

4. true / false Evidence of the Sapir-Whorf hypothesis is the fact that the people cling to their first programming language.

5. The sky does not have a color because: (a) it contradicts physics; (b) the ancient Greeks drank too much (purple) wine; (c) ancient people couldn’t see the sky because of thick (green) foliage; (d) one cannot paint it
1. Alfred Tarski (1902–1983) is known for: (a) theory of computation; (b) semantics; (c) finding’s Frege’s flaw; (d) theory of quantification

2. Using predicate logic, formulate the sentence: every student has some professor they admire. Use the predicates $S(x)$ for student, $P(x)$ for professor, and $A(x, y)$ for $x$ admires $y$.

3. true / false Programming on a Turing machine is very rudimentary.

4. Which one of the following does not predate FORTRAN (a) Plankalkül; (b) IBM 704; (c) APL; (d) Short code

5. Which one of the following is not a programming language: (a) Go; (b) Rust; (c) Ruby; (d) Diamond; (e) Lua
Quiz: Wed, 29 Aug 2018

1. true / false Declarative programming emphasizes the “how” over the “why.”

2. true / false HTML is not a general purpose programming language.

3. true / false Russell’s paradox is a linguistic and not a mathematical paradox.

4. XXXIII divided by IV is:
   (a) V; (b) VI; (c) VII; (d) VIII; (e) IX.

5. The name of the Greek letter π rhymes with all of the following Greeks letters except for:
   (a) ν; (b) ξ; (c) φ; (d) χ; (e) ψ.

Use the back of old quiz cards!
1. true / false FORTRAN can reasonably be considered the first programming language.

2. true / false The syntax known as “Cambridge prefix” is used for all data and all code in LISP.

3. true / false ISO stands for the organization officially known as the International Standards Organization.

4. Surprisingly the programming language _______ is used today in financial applications. It was originally designed in the 1960’s to describe hardware and relies heavily on arrays and vectors. It has a modern successor called _______.

5. Grace Hopper led the development of _______, a programming language for business applications.
Quiz: Wed, 5 Sep 2018

1. Ada
2. APL
3. COBOL
4. C++
5. C
6. FORTRAN
7. Java
8. LISP
9. Pearl
10. Python

A. IBM, J. Backus
B. Augusta Ada
C. Dahl and Nygaard
D. Ralph Griswold
E. Kenneth Iverson
F. Guido van Rossum
G. John McCarthy
H. Kernighan and Richie
I. Bjarne Stroustrup
J. Sun, J. Gosling
K. US DoD, G. Hopper
L. US DoD, J. Icbaih
M. Larry Wall
Quiz: Wed, 7 Sept 2018

1. A *lexeme* is a
   (a) letter; (b) token; (c) word; (d) phrase

2. In formal languages, a *symbol* is
   (a) a letter used to designate something (b) hallmark or emblem
   (c) a sign to represent something such as an organization (d) one
   indivisible element of a notational system

3. The perspective the programming language field has on syntax can best be described as:
   (a) annoyance; (b) basic implementation; (c) construction;
   (d) description

4. true / false  Formal language theory applies to the lexical structure of programming languages, but not to the phrase structure.

5. true / false  A formal language is a set of symbols from an alphabet.

6. true / false  Language can be studied in three parts: pragmatics, syntax, and semiotics.
Quiz: Mon, 10 Sept 2018

What formal languages over the alphabet \{a, b, c, d\} do the following regular expression represent? Choose from the formal languages below. (You may choose a letter any number of times.)

1. \(\emptyset^*\)
2. \((a + b)^*\)
3. \((a^*)^*\)
4. \((a + \emptyset)^*\)
5. \(((a \cdot b) + (c \cdot d))\)
6. \(((a \cdot b) + (c \cdot d))^* \cdot c\)
7. \(((a + b) + a^*) \cdot c\)
8. \((a^* + b)^*\)
9. \(((a + b)^* + (a + c)^*)\)

A. \{"\}
B. \{"\epsilon\"
C. \{"abcd\"
D. \{"ab, cd\"
E. \{"a, b, aa, ab, ba, bb, . . .\"
F. \{"a, b, aa, ab, ba, bb, . . .\"
G. \{"ac, bc, aac, abc, bac, bbc, . . .\"
H. \{"c, abc, cdc, abcdc, cdcdc, cdabc, ababc, . . .\"
I. none of the above
Quiz: Wed, 12 Sept 2018

1. true / false Syntax diagrams are equivalent to context-free grammars.
2. true / false Back references can be defined in terms of the primitive regular expressions and, so, are just “macros” or “syntactic sugar.”
3. true / false Regular expressions are great because they are more expressive than other common formalisms.
4. true / false There are tools in wide-spread use to generate scanners automatically from regular expressions.
5. true / false Scanner generators and parser generators are examples of a kind of programs which enable programmers to describe what they want and not how to implement it.

6. If \d is the regular expression for a digit ([0–9]), then the regular expression \d+ \d+? matches what part of 321 3451324?
   (a) 3 3; (b) 3 3451324; (c) 321 3; (d) 321 3451324.
1. Show that the following grammar with non-terminals $S$, $A$, and $I$ is ambiguous:

\[
\begin{align*}
S & \rightarrow A \\
A & \rightarrow A \times A \mid I \\
I & \rightarrow a \mid b \mid c
\end{align*}
\]
Test on Monday, 24 Sept 2018!
Syntax and Semantics

1. true / false The Cherokee script is used in writing FORTRAN programs.
2. true / false Assertions in programs help debugging.
3. true / false A formula of first-order logic can be used to characterize a set of computer states.
4. true / false “Sue me if my postcondition is false, sue you if my precondition is false.”
5. Complete the last two columns of the following truth table.

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<td>C</td>
<td>A&amp;B</td>
<td>A&amp;B ⇒ C</td>
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</table>
Syntax and Semantics

Fill in the box with the phrase that best describes the approach of each of the following types of semantics:

1. [ ] denotational
2. [ ] operational
3. [ ] natural
4. [ ] structural
5. [ ] axiomatic

is defined in terms of . . .

A rules for evaluation
B Post systems
C rules relating states
D attribute grammars
E mathematical objects
F “small-step” transitions
G an abstract machine
H a 1985 song by Paul Hardcastle “19”
Using the axiom of assignment and the rule of composition (but not the rule of consequence), compute the (weakest) precondition for the following program fragments with respect to the given postcondition.

1. \( a := b + 3 \{ a = 7 \} \)
2. \( a := a + 1 \{ a = a + b \} \)
3. \( a := a + 1 \{ b = 7 \} \)
4. \( a := a + 1; b := b \times c \{ b = c^{a} \} \)
Quiz: Fri, 28 Sep 2018

1. true / false  Names allows programmers to refer to high-level abstractions.

2. true / false  In Java every identifier must be declared before it is used.

3. true / false  The variable Kotlin does not have to declared before it is used in Fortran.

4. Who was the first Turing Award recipient? (a) Alan Mathison Turing; (b) Donald Knuth; (c) Alan Jay Perlis; (d) Alan Curtis Kay.

5. What does abstraction in the context of statements lead to? (a) a head ache; (b) subprocedures; (c) functions; (d) data abstraction; (e) garbage collection.

6. What does abstraction in the context of expressions lead to? (a) another head ache; (b) subprocedures; (c) functions; (d) data abstraction; (e) garbage collection.
Quiz: Mon, 1 Oct 2018

1. true / false  Names refer only to locations in programs.
2. true / false  Late binding in generally more flexible.
3. true / false  An environment is a kind of a function.
4. true / false  In some languages, for instance Pascal, constants are required to have a value than can be determined a compile time.

5. What is the proof rule in Hoare logic for the while statement in the simple while language?
Quiz: Wed, 3 Oct 2018

1. true / false  Extent is measured in inches and scope in time.

2. Which one of the following is not a principle storage management mechanism:
   (a) static; (b) stack; (c) instance; (d) heap

3. true / false  Elaboration time is subsumed (it occurs during) run time.

4. true / false  Stack-allocated objects require complex storage management.

5. Which one of the following programming languages does not have explicit deallocation:
   (a) C; (b) C++; (c) Java; (d) Rust
Quiz: Fri, 5 Oct 2018

1. true / false  Pointers limit concurrency.
2. true / false  Pointers are easy to reason about.
3. true / false  Recursion is easy to reason about.
4. Which of the following is not a kind of assignment. (a) “let”; (b) storage; (c) pointer; (d) “with”
5. When is the Go project due?
Quiz: Wed, 10 Oct 2018

1. true / false  Conservative garbage collection may create memory leaks.

2. true / false  Dynamically allocated objects tend to live a short amount.

3. true / false  The primary problem with reference counting is unpredictability.

4. Which of the following is not a part of generational garbage collection. (a) eden; (b) primogeniture; (c) tenured;
Quiz: Fri, 12 Oct 2018

1. mark-sweep

2. stop and copy

3. generational

4. conservative

5. reference counting

A. Eden, tenured, . . .

B. incremental bookkeeping

C. polymorphism

D. if it looks like a pointer, . . .

E. the Korean reality girl group TV show, *Sixteen*

F. theoretical framework

G. follow everything

H. keep half in reserve
1. true / false  Detecting errors in a program by the compiler is valuable.

2. true / false  It is possible for a compiler to reject all programs that go into an infinite loop on some input data.

3. true / false  A type insecurity arises when the data is misinterpreted.

4. true / false  Tractable means practical.

5. true / false  Early error detection reduces programming flexibility.

6. true / false  A program that cannot be statically type checked has a type insecurity.
How does union in the C programming language cause a type insecurity?
1. true / false  An associative array is dynamically-accessed, homogeneous, composite data structure.

2. true / false  A language with associative arrays can be strongly typed.

3. true / false  Defining the right type system is an important research area in programming language design.

4. true / false  Java and C++ have evolved toward the goal of type completeness.

Questions to think about:

1. What is the difference between discrete and scalar types?
2. What are aggregates?
3. Can a language be strongly typed and dynamically typed?
1. true / false  In our context, polymorphism means “many values.”

2. true / false  Ada uses name equivalence.

3. true / false  C uses name equivalence.

4. true / false  Modula-3 uses name equivalence.

5. true / false  Java uses name equivalence.

6. true / false  A characteristic of universal polymorphism is a finite number of possibilities.

7. true / false  Implicit coercion is an example of universal polymorphism.

8. true / false  “Branding” allows the programmer to make structural equivalence when the language supports name equivalence.
1. true / false  The record \{a:int\} is a subtype of \{a:int,b:char\}.

2. true / false  The array type operator in Java is covariant.

3. true / false  The array type operator in C# is covariant.

4. true / false  The List type operator in Java is covariant.

5. true / false  The List type operator in Java is contravariant.

6. true / false  Arrow (function) types are, by their nature, covariant in the domain and contravariant in the range.

7. true / false  The typing rule for arrays in Java is not type safe.

8. Bounded quantification polymorphism is a combination of \underline{} and \underline{}.