CS 280

Midterm Exam Example with Solution

Total Points: 50

1. **(14 points, 1 point each) True/False Questions:** For each of the following, write **T** if the statement is true and **F** if it is false. You must use **T** or **F**. Do not use x's or check marks they will be counted as wrong answers.

	Statement	T/F
1	Linking is the process of collecting system programs and linking them to user programs.	T
2	It is generally accepted that aliasing is not a dangerous feature in programming language.	F
3	BNF is a metalanguage for programming languages.	T
4	Attribute grammars are extensions to context-free grammars.	T
5	A grammar that generates a sentential form for which there are two or more distinct parse trees is said to be unambiguous.	F
6	A recursive descent parser has a subprogram for each nonterminal and terminal in its associated grammar.	F
7	A reserved word is a special word that cannot be used as a user-defined name.	T
8	Dynamic scoping.is based on the calling sequence of subprograms not their special relationship to each other.	T
9	Implicit declarations of variables do not create static bindings to types.	F
10	The symbol table role is to serve as a database for the compilation process.	T
11	Multidimensional arrays are stored in row major order in C++.	T
12	The representation of decimal data types using Binary Coded Decimal (BCD) takes the same storage space as binary representation.	F
13	A grammar with left recursive rules cannot be directly used to implement a recursive descent parser.	T
14	In languages with dynamic typing, any type errors are in general only detected at run time.	T

2. **(36 points, 2 points each) Multiple Choice Questions:** Circle one of the given choices for the answer of each question.

1. Which produces faster program execution, a compiler or a pure interpreter.

   a. Compiler
   b. pure interpreter
   c. Either one of them
   d. Hybrid implementation system

2. What is the programming language category whose structure is dictated by the von Neumann computer architecture?

   a. Imperative.
   b. Logic
   c. Functional
   d. Object oriented

3. What have been the strongest influences on programming language design over the past 60 years?

   a. Computer architecture only
   b. Programming design methodologies
   c. Both Computer architecture and Programming design methodologies
   d. Diversity of application areas

4. What is the correct EBNF for the following BNF rule?

   term → term * factor
   | term / factor
   | term % factor
   | factor

   a. term → term (* | / | %) factor
   b. term → term {(* | / | %) factor}
   c. term → factor {(* | / | %) factor}
   d. term → factor (* | / | %) factor

5. Given the following grammar rules:

   expr → expr + term | term

   term → term * factor | factor

   The grammar rules determine the precedence of * and + operators as follows.

   a. * operator has higher precedence than the + operator
   b. + operator has higher precedence than the * operator

c. Both operators have the same precedence
d. The precedence of operators cannot be determined from the given grammar rules

6. Which regular expression that matches a sequence of one or more A's or B's followed by zero or one C?

a. `[AB]+C?`
b. `[AB]*C?`
c. `[AB]C?`
d. `[AB]C`

7. Which regular expression that matches a sequence of a string of zero or more even digits of any length followed by one or more letters?

a. **`[0 2 4 6 8]*[a-zA-Z]+`**
b. **`[0 2 4 6 8]+ [a-zA-Z]+`**
c. **`[0 2 4 6 8][a-zA-Z]`**
d. **`[0 2 4 6 8]?[a-zA-Z]*`**

8. Given the following grammar with nonterminals *S*, *A*, and *B*?
S → A a B b
A → A b | b
B → a B | a

Which of the following sentences is a valid one in the language generated by this grammar.

a. **baab**
b. **bbbab**
c. **bbaaaa**
d. **bbabb**

9. Given the following regular expression:
`[a-zA-Z]+\.c`

Indicate the character in the following string where the mismatch happens.
Prog5.c

a. `P`
b. `5`
c. `.` (dot)
d. c

10. Which of the following LL grammar rules fails the pairwise disjointness test. Where a, b, and c are terminals.

    a. `A → aB | b | cBB`
    b. `F → aF | bG | aFb`
    c. `C → aaD | b | caE`
    d. `H → b {aI} | a`

11. Why does the following grammar rules cause a catastrophic problem for recursive-descent parser?

    i. E → E + T | T
    ii. T → T * F | F
    iii. F → (E) | id

    a. Rules (i) and (ii) have direct left recursion.
    b. The grammar is ambiguous.
    c. The grammar rules need to enforce operator precedence.
    d. The grammar rules do not pass the disjointness test.

12. Given the following declaration,

```
int *ptr;
int x = 5;
```

    What is the *r-value* of *ptr* in the following statement?

```
ptr = & x;
```

    a. L-value of x variable.
    b. R-value of x variable.
    c. Pointer variables do not have an r-value.
    d. R-value for ptr has not been defined.

13. The storage binding of all declared local variables in C++ functions are of the category of _____.

    a. Stack-dynamic variables.
    b. Explicit-Heap dynamic variables.
    c. Implicit Heap-Dynamic variables.
    d. Static variables.

14. All created class objects in Java must be allocated memory storage _____.

a. Explicitly from the heap using the `new` operator.
b. Implicitly dynamic from the heap.
c. Dynamically from the run-time stack.
d. Statically from the data segment by the compiler.

15. Consider the following C function definition,

```
void function(void){
   int a, b, c;//definition 1
   . . .

   while (. . .) {
      int b, d;//definition 2
      . . .
      . . .
      if (. . .) {
         int e, a;//definition 3
         . . . //Point 1
      }
   }
}
```

Determine the visible variables at Point 1, inside the if statement of the function, using the labelled definition statements by comments in the function,

a. Variables `a` and `e` from definition 3, variables `b` and `d` from definition 2, and variables `c` from definition 1.
b. Variables `a` and `e` from definition 3, and variables `b` and `d` from definition 2.
c. Variables `a` and `e` from definition 3, and variables `b` and `c` from definition 1.
d. Variables `a` and `e` from definition 3 only.

16. Given this code:

```
int z[] = { 8, 4, 7, 5 };
```

The value of `*(z + 2)` is

a. 8
b. 4
c. 7
d. 5

ANS: C

17. Which of the following primitive data types is not a reflection of the hardware, i.e., it is not supported by hardware implementation.

    a. Integer
    b. Floating-point
    c. Character
    d. Boolean

18. Given the following C++ definition and declarations:

```
enum Season {Summer, Fall, Winter, Spring};
Season thisSeason;
int res;
```

    Which one of the following statements would generate a syntax error?

```
a. thisSeason = Winter;
b. res = Spring;
c. thisSeason = (Season) 2;
d. thisSeason = 2;
```