



2012 Academic Challenge

COMPUTER SCIENCE TEST - SECTIONAL

This Test Consists of 30 Questions

Computer Science Test Production Team

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GENERAL DIRECTIONS

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. Only one oval should be marked to answer each question. Multiple ovals will automatically be graded as incorrect answers.

Be sure ovals are marked as  , not  ,  ,  , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

***** TIME: 40 MINUTES *****

DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!

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WYSE – Academic Challenge
Computer Science Test (Sectional) – 2012

1. Within a relational database, SQL may be used to:
 - a) define tables
 - b) define relationships between tables
 - c) insert records into tables
 - d) update existing data
 - e) all of the above

2. What is the number of 8-bit bytes needed to store a Unicode, UTF-32 character?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

3. What type of document typically has characters printed with magnetic ink?
 - a) report cards
 - b) a banking account deposit slip
 - c) tickets to baseball games
 - d) letters from senators
 - e) coupons

4. CMOS is a common acronym for which of the following?
 - a) core memory operating system
 - b) complementary metal oxide semiconductor
 - c) C++ memory overload state
 - d) cache memory overclock stage
 - e) current machine optical slot

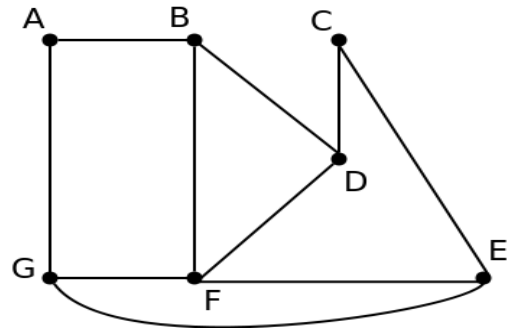
5. Unlike 2's complement numbers, where the most significant bit actually has a negative magnitude, a biased binary number will always subtract a constant value from the number to obtain negative values. The number given is calculated as though it was entirely positive and then the bias is subtracted. The amount subtracted, or bias, for an n bit number is $(2^{n-1} - 1)$. For an 8 bit biased number, what is the range of signed values that can be represented?
 - a) -127 to 127
 - b) 0 to 255
 - c) -128 to 127
 - d) -127 to 128
 - e) 1 to 256

6. Convert the 8-bit 2's complement number, 10100101, to decimal.
 - a) A5
 - b) 165
 - c) -37
 - d) -38
 - e) -91

7. Which of the following expressions is equivalent to (A AND B)?
 - a) A' AND B'
 - b) FALSE
 - c) TRUE
 - d) A' OR B'
 - e) A OR B

8. What is the equivalent value of the following expression if B is TRUE?
(A XOR B) OR (ABC')
 - a) A OR AC'
 - b) A' OR AC'
 - c) AC'
 - d) TRUE
 - e) FALSE

9. A depth first search of the graph starting at node **A** would visit the nodes in which order?



- a) ABCDEFG
- b) AGFEDCB
- c) AGBFEDC
- d) ABGDFEC
- e) ABDCEFG

10. PUSH puts an item on a stack and POP removes an item from the stack. What are the contents of the stack after the following operations?

PUSH(A); PUSH(B); PUSH(C); POP(); PUSH(D); PUSH(E); PUSH(F); POP();

- a) ABCD
- b) BDEF
- c) ABCDEF
- d) CDEF
- e) ABDE

```
// *** Use the following code for questions 11, 12, & 13 *** //
int i, j;
for (i=0,j=0;i<10;i++) {
    if (i%3 == 0) {
        j--;
        continue;
    }
    j += 2;
}
cout << i << " " << j;
```

11. What is the % operator?

- a) Floating point division
- b) Modulus
- c) Integer division
- d) Percentage
- e) None of the above

12. What statement executes after the `continue` statement?

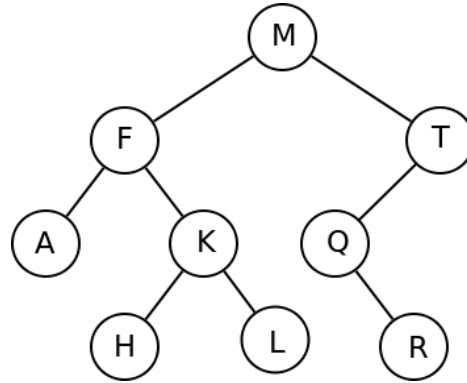
- a) `cout`
- b) `j += 2`
- c) `for`
- d) `if`
- e) `j--`

13. What will be output from this code?

- a) 8 8
- b) 10 10
- c) 9 10
- d) 10 8
- e) 10 11

14. How many leaves does the following tree contain?

- a) 9
- b) 8
- c) 5
- d) 4
- e) 3



15. A bubble sort of a list of 100 items will take at most how many comparisons?

- a) 99
- b) 100
- c) $(99 \cdot 100) / 2$
- d) $100!$
- e) $100 \cdot \log_2 100$

```

// *** Use the following code segment for questions 16, 17, & 18 *** //
int i, j;
for (i=0; i<4; i++) {
    for (j=0; j<=i; j++)
        cout << j;
    cout << endl;
}
  
```

16. This code segment has a(n) _____ loop.

- a) nested
- b) sequential
- c) infinite
- d) smart
- e) long

17. What will be output from this code?

- a) 0010120123
- b) 0112223333
- c) 0
01
012
0123
- d) 0
11
222
3333
- e) 0123

18. If the statement `cout << j;` were changed to `cout << i;` what would be output from this code?

- a) 0010120123
- b) 0112223333
- c) 0
01
012
0123
- d) 0
11
222
3333
- e) 0123

22. Within which block(s) of code is the variable `a` (marked for this question) changed?
- main
 - main and `my_func1`
 - main and `my_func2`
 - main, `my_func1`, and `my_func2`
 - `my_func1` and `my_func2`
23. Which of the following best describes variable `a` (marked for this question)?
- global
 - static
 - const
 - static
 - recursive
24. If the user inputs 2, what will the output be?
- 128
 - 648
 - 1
 - 2048
 - 4096

```
// *** Use the following code for questions 25, 26, & 27 *** //
1 > int* a1 = new int;
2 > int* a2 = new int;
3 > int a3 = 20;
4 > *a1 = a3;
5 > *a2 = 25;
6 > cout << *a1 << " " << *a2 << " " << a3 << endl;
7 > *a1 = 5;
8 > a1 = a2;
9 > a3 += 5;
10> cout << *a1 << " " << *a2 << " " << a3 << endl;
11> a3 += *a2;
12> *a2 = a3;
13> delete a1;
14> cout << *a1 << endl;
```

25. When is the memory allocated for the integers pointed to by `a1` and `a2`?
- When the program is written
 - When the program is compiled
 - When the program is executed
 - When the user replies to a pop-up dialog box
 - When the memory for `a3` is allocated
26. What will be on the second line of output from line 10?
- 20 25 20
 - 25 25 25
 - 5 25 20
 - 5 5 20
 - Unknown
27. What will be on the third line of output?
- 2
 - 5
 - 20
 - 25
 - Unknown

```
// ***** Code used on problems 28, 29 and 30 *****//
1 > class person {
2 >     private:
3 >         string name;
4 >         int age;
5 >     public:
6 >         person()           { name="DEFAULT NAME"; age=20; };
7 >         void setAge (int a) { age = (a<0) ? 1: a; };
8 >         void setName(string s) { name = s; };
9 >         int  getAge ()   const { return age; };
10>        string getName() const { return name; };
11>        bool operator> (const person &right) const {
12>            return (name>right.name || name == right.name && age > right.age);
13>        };
14>        person operator++(int);
15> }; // end of person class
16>
17> person person::operator++(int) {
18>     person temp = *this;
19>     age++;
20>     return temp;
21> } // end ++ operator
```

28. Which of the methods from the person class are inline?
- All of the methods are inline.
 - Everything except the constructor.
 - All methods except the overloaded ++ and > operators.
 - All methods except the overloaded ++ operator.
 - All methods except the overloaded > operator.
29. Using the `setAge` and `getAge` methods is an example of which tenet of Object Oriented Programming?
- Polymorphism
 - Encapsulation
 - Inheritance
 - Abstraction
 - None of the above.
30. Which of the following is true regarding the overloaded operator ++?
- This post-increment operator increments the age by 1.
 - The use of this operator will cause a runtime error.
 - The use of this operator will cause a compiler error.
 - This pre-increment operator will increment the age by 1.
 - The operator increments the `temp` object of type `person`.