WYSE | ENGINEERING AT ILLINOIS

2016 Academic Challenge

COMPUTER SCIENCE TEST – SECTIONAL

– This Test Consists of 30 Questions –

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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. One oval should be marked to answer each question. Multiple ovals will automatically be graded as an incorrect answer.

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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Use the following code for Questions 1, 2, & 3.

```
1      class person {
2        private:
3          string name;
4          int age;
5        public:
6          person() { name="DEFAULT"; age=1; };
7          void setAge(int a)     { age = (a<0) ? 10: a; };
8          void setName(string s) { name = s;            };
9          int getAge ()   const  { return age;          };
10         string getName()const  { return name;         };
11     }; // end of person class
12
13     person p, list[10];
```

1. Which of the following statements is valid given the person declarations on line 13?

    a. `p.age = 17;`   b. `p.setAge(-1);`

    c. `list.getName();`   d. `list[2].setAge() = 17;`

    e. `cout << p.getName;`

2. Which of the following will be printed by the following code?

```
for (int i=0; i<10; i++)
   list[i].setAge(i+5);
cout << list[6].getName() << list[6].getAge();
```

    a. `DEFAULT1`

    b. `DEFAULT 10`

    c. `DEFAULT11`

    d. Cannot be determined from information given.

    e. The code causes a compiler error.

3. Which of the following best describes the methods on lines 7 thru 10?

    a. Encapsulation

    b. Polymorphic

    c. Overloaded

    d. Inherited

    e. Static

4. Which of the following is not true regarding a queue?

    a. The enqueue operation adds items to the end of the queue.
    b. The dequeue operation removes items from the front of the queue.
    c. A queue may be implemented with an array.
    d. A queue may be implemented using a linked list.
    e. A queue may be implemented with an associative array or hash.

5. Given the two stack operations below, what will the stack look like after the following operations assuming the stack was empty to start?

   PUSH - put item on top of stack
                   POP   - take item off top of stack

    PUSH A; PUSH B; PUSH G; POP; PUSH A; POP; PUSH D; PUSH A;

    a. ABGADA   b. ABDA   c. ADAGBA   d. GADA   e. BAAD

6. The following algorithm is used to multiply two matrices. What is the algorithmic complexity of this code?

```
int A[n][n], B[n][n], C[n][n];
// Assume values for A and B have been set between
// initialization and running this code.
for (i=0; i<n; i++)                 // for each row
    for (j=0; j<n; j++)             // for each column in that row
        C[i][j] = 0;
        for (k=0; k<n; k++)   // multiply
            C[i][j] += A[i][k] * B[k][j];
```

    a. BigO(n)   b. BigO(n^2)   c. BigO(n*log(n))   d. BigO(log(n))   e. BigO(n^3)

7. Which of the following statements regarding the tree to the right is not true?
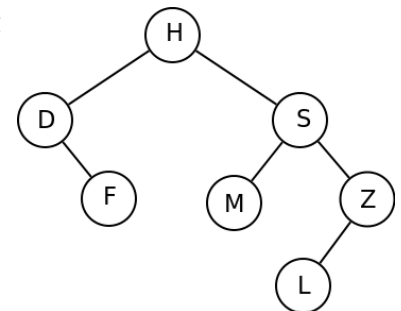
    a. The tree has three leafs.
    b. A post-order traversal would first process node F.
    c. This is a binary search tree.
    d. This tree has a depth of three.
    e. Nodes M and Z share the same parent.

8. Convert the following hexadecimal number to decimal: 310

   a. 110001000   b. 310   c. 784   d. 4960   e. 136

9. If A is false and B is true, which answer is equivalent to the following Boolean expression?

   (A xor B)' or ABC

   a. C   b. C'   c. True   d. False   e. None of the above.

10. Which of the following methods is not used to store integer numbers?

    a. One's Complement   b. Signed Magnitude
    c. Two's Complement   d. Biased
    e. All of the above are used to represent
       integers.

11. Truth tables and Karnaugh maps are both ways to visually represent each state of a given Boolean expression. Which of the following statements is not true regarding them?

    a. A truth table with three input variables will have eight rows to represent the output.
    b. A Karnaugh map is used to obtain the minimal sum of products form for a given output.
    c. A truth table and Karnaugh map with four inputs will have sixteen different places for the output.
    d. Using a Karnaugh map properly will yield a unique minimal expression.
    e. None of the statements is false, all are true.

12. The rules for exchanging data between computers are called _____ .

    a. protocols   b. headers   c. trailers   d. checksums   e. CRCs

13. How many bytes can a 64-bit computer access at one time?

    a. 4   b. 8   c. 32   d. 64   e. None of the above

14. In a TCP/IP network, what is the value of the host bits in a broadcast address?

    a. All 1s   b. All 0s
    c. Alternating 1s and 0s   d. Alternating 0s and 1s
    e. None of the above.

15. What type of computer attack attempts to slow down or stop a computer system or network by flooding a computer or network with requests for information and data?

    a. Trojan horse   b. Virus
    c. Worm   d. Denial of service attack
    e. Social engineering

16. Which of the following operators cannot behave as a unary operator?

    a. !   b. `++`   c. `--`   d. `-`   e. All are unary operators.

17. Which block of code correctly implements the flowchart to the right?

    a.   `for (n=0;n<10;n++);`

    b.   `n = 0;`
```
      while (n < 10)
         n++;
```

    c.   `n = 0;`
```
      do {
         n++;
      } while (n < 10);
```

    d.   Both a & b

    e.   None of the above.
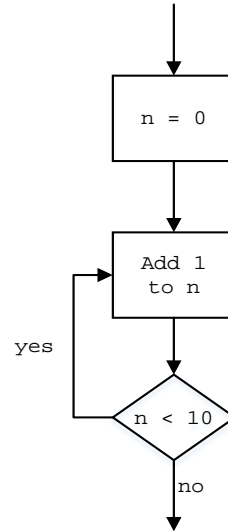
Use the following code for Questions 18 through 21.

```
int func1(int a, int b) {          int func2(int a, int &b) {
   int c = 2;                         int c = 2;
   a += c++;                          a += ++c;
   return a+b;                        return a+b;
}                                  }


int func3(int a, int b) {          int func4 (int a) {
   static int c = 2;                  if (a<=1)
   a += ++c;                             return 1;
   return a+b;                        else
}                                        return a+func4(a-2);
                                   }
```

18. Which of the functions uses pass by reference?

    a. func1   b. func2   c. func3   d. func4   e. All use pass by reference.

19. Assuming the variables used in the answers below have been previously declared as integers, which statement will not compile?

    a. `a = func1(a, a);`   b. `b = func3(c, 5);`

    c. `a = func2(c, 5);`   d. `cout << func4(-1);`

    e. All of the statements will compile properly.

20. Trace the following code and determine the output.

```
int a = func1(2, 2);
cout << func2(2, a);
```

    a. 11   b. 12   c. 30   d. 7   e. None of the above.

21. Trace the following code and determine the output.

```
int a = 5, b = 2, c = 10;
cout << func3(a, b);
cout << func3(b, b);
```

    a. 97   b. 117   c. 811   d. 108   e. None of the above.

Use the following code for Questions 22, 23, & 24.

```
1     int funA(int n)
2     {
3         int xx = 1;
4         for(int i = 0; i < n; i++)
5             xx += n;
6         if (xx < 3 || xx > 10)
7             return xx - n;
8         else
9             return xx + n;
10    }
11    int main() {
12        int x = 3;
13        cout << funA(x);
14    }
```

22. What will be the output on line 13?

    a. 3   b. 10   c. 13   d. 5   e. 4

23. What is the || operator on line 6?

    a. or   b. and   c. xor   d. not   e. true

24. If the || operator were replaced with the `&&` operator, what would the result be?

    a. Line 7 would always be executed.
    b. Line 9 would always be executed.
    c. A syntax error would occur.
    d. A runtime error would occur.
    e. None of the above.

Use the following code for Questions 25 & 26.

```
1    const char* pstr[] = {  "Monday",
2                            "Tuesday",
3                            "Wednesday",
4                            "Thursday",
5                            "Friday",
6                            "Saturday",
7                            "Sunday"
8    };
9    cout << pstr[2][2];
10   cout << pstr[1];
```

25. What would be displayed by `cout` statement on line 9?

    a. d   b. Tuesday

    c. Wednesday   d. u

    e. Causes runtime error

26. What will be the output to the screen by the `cout` statement on line 10?

    a. Monday   b. Tuesday

    c. The memory address of `pstr[1]`   d. The size of the array

    e. None of the above.

27. What does the sizeof operator return?

    a. The number of lines of code in the function.

    b. A floating point number that represents the circumference of a circle.

    c. An integer that is the volume of a rectangle.

    d. An integer that gives the number of bytes in the sizeof's operand.

    e. The size of the CPU in the computer.

Use the following code for Questions 28, 29, & 30.

```
1      int main() {
2          int x = 0, y;
3          cin >> x;
4          switch(x)
5          {
6              case 1:
7              case 2:
8              case 3: y = 10;
9                      break;
10             case 4: y = 20;
11                     break;
12             default: y = 30;
13         }
14         cout << y;
15     };
```

28. Given a user input of 4, what will be the output on line 14?

  a. 10   b. 20   c. 30   d. 14   e. None of the above.

29. What input would cause y to be set to 30?

  a. Any user input.
  b. A user input of 1, 2, or 3.
  c. A user input of 4.
  d. A user input of 2 or 3.
  e. A user input that is less than 1 or greater than 4.

30. What type of logic structure is the switch statement?

  a. Loop   b. Repetition
  c. Sequence   d. Selection
  e. None of the above.