2016 Academic Challenge

COMPUTER SCIENCE TEST – STATE

– 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!

WYSE – Academic Challenge
Computer Science Test (State) – 2016

1. Rank the growth of the magnitude of the following functions as n becomes a large integer with the slowest growing function listed first and the fastest growing function listed last.

   I. n II. $n!$ III. $n * \log_2 n$ IV. $\sqrt{n}$ V. 2^n

   a. I,IV,III,V,II b. IV,I,III,V,II c. III,IV,I,V,II d. III,I,IV,II,V e. IV,III,I,IV,V

Use the following code for Questions 2 & 3.

```
1   struct node {
2     int data;
3     node* next;
4   };
5
6   node *head, *n;
7   head = new node;
8   head->data = 5;
9   head->next = new node;
10  head->next->data = 7;
11  n = head->next;
12  n->data = 8;
13  n->next = NULL;
```

2. What is the order and contents of the linked list after line 13 executes?

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

3. Which snippet of code will add a new node with data element of 11 to the beginning of the list, retain the previous contents of the list, and have `head` point to the front of the list?

   a.
   ```
   n = new node;
   n->data = 11;
   head = n;
   ```

   b.
   ```
   head = new node;
   head->data = 11;
   ```

   c.
   ```
   n = new node;
   n->data = 11;
   n->next = head;
   head = n;
   ```

   d.
   ```
   head->next = new node;
   head->next->data = 11;
   head->next = head;
   ```

   e.
   ```
   n = new node;
   n->data = 11;
   n->next = head;
   ```

4. Convert the floating point hexadecimal number to its equivalent decimal number: A7.C

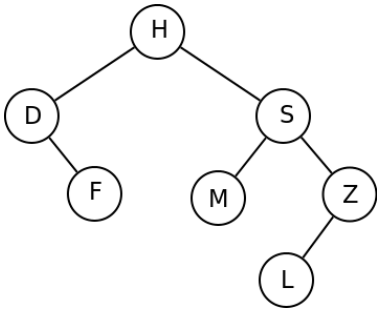
   a. 10100111.1100 b. 167.5 c. 2684 d. 167.75 e. A7.C

5. Assume that a given queue starts out empty and that the following ENQUEUE and DEQUEUE operations are executed. Determine the contents of the queue.

   QUEUE(A); QUEUE(B); QUEUE(D); DEQUEUE(); ENQUEUE(F); DEQUEUE(); ENQUEUE(C);

   a. DFC b. ABD c. ABDFC d. CFDBA e. BDC

6. Which of the following represents a pre-order traversal of the tree to the right?



   a. FDHMLZS
   b. DFHMSLZ
   c. HDSFMZL
   d. HDFSMZL
   e. DFHLMSZ

7. Determine the minimal sum of products expression for the Karnaugh map to the right.

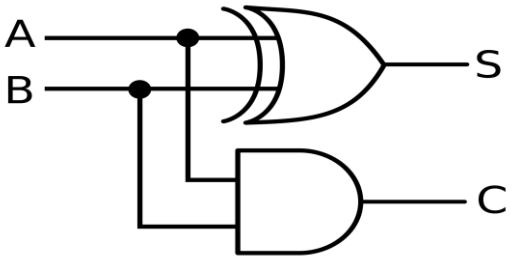
	C'D' 00	C'D 01	CD 11	CD' 10
A'B' 00	1	1	0	0
A'B 01	1	1	0	1
AB 11	1	0	0	1
AB' 10	1	0	0	0

   a. C'D' + C'DA' + BC'D
   b. C'D' + A'C' + BD'
   c. C'D' + BD'
   d. C'D + A'C' + BC'D'
   e. None of the above.

8. Convert the following 8-bit two's complement number to decimal: 10100010

   a. 2011121 b. 10100001 c. -65 d. 161 e. -94

9. For the circuit to the right, determine which line, if any, in the table is not correct.



	A	B	S	C
I.	F	F	T	F
II.	F	T	T	F
III.	T	F	T	F
IV.	T	T	F	T

   a. I b. II c. III d. IV e. All lines are correct

Use the following code for Questions 10, 11, 12, & 13.

```
1   class person {
2      private:
3         string name;
4         int age;
5      public:
6         person() { name="DEFAULT"; age=10; };
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
12        bool operator>  (const person &right) const;
13        person operator++();
14  }; // end of the person class header
15
16  person person::operator++() {
17     age++;
18     return *this;
19  }  // end pre-increment
20
21  bool person::operator> (const person &right) const {
22     return age > right.age;
23  }  // end overloaded >
24  // end of the person class
25
26  class student: public person {
27     private:
28        float gpa;
29     public:
30        student() { gpa = 4.0; }
31        float getGpa () const  { return gpa; }
32        void  setGpa (float g) { gpa = (g >= 0 && g <= 4) ? g : 4; }
33  }; // end student class
34
35  person p; student list[4];
```

10. For the code on line 35, how many constructors are called to instantiate the objects?

a. 1 b. 2 c. 5 d. 6 e. 9

11. Which line of code will generate a compiler error?

a. `p.setAge(-2);`
b. `list[0].setAge(3);`
c. `cout<< p.getGpa();`
d. `list[2].setGpa(3.5);`
e. `list[2]++;`

12. Which of the following best describes the relationship between a person and student?

a. person IS-A student
b. person HAS-A student
c. student IS-A person
d. student HAS-A person
e. There is no relationship between the two classes

13. The code from line 16 through 24 best illustrates which principal of Object Oriented Programming?

    a. Abstraction
    b. Encapsulation
    c. Inheritance
    d. Polymorphism
    e. Least Privilege

14. Within the transport layer of the TCP/IP networking model, which protocol is best suited for streaming video?

    a. UDP b. TCP c. IP d. ARP e. ICMP

15. What is the process called when the default gateway opens an IP datagram and replaces a client's private IP address with an Internet-recognized IP address?

    a. DNS b. NAT c. Proxy server d. SMTP e. TCP/IP

16. What does the information security acronym, CIA, represent?

    a. Central Intelligence Agency
    b. Common Intrusion Access
    c. Computer Instruction Amendments
    d. Confidentiality Integrity Availability
    e. Core Infrastructure Alternatives

17. Which of the following describes a computational technique that mimics the biological reasoning process that humans possess?

    a. Expert systems
    b. Decision support systems
    c. Transaction process systems
    d. Neural networks
    e. None of the above.

Use the following code for Questions 18 & 19.

```
1       int func (int a = 4) {
2          if (a<=1)
3             return 1;
4          else
5             return a+func(a-2);
6       }
```

18. Which of the following statements is not true regarding the function, `func`?

    a. This is a recursive function.
    b. This function requires an input value.
    c. The base case for this function is a<=1.
    d. This function uses pass by value.
    e. All statements are true.

19. What is the output of the following function call?

```
cout << func(8);
```

a. 8 b. 8! c. 21 d. 36 e. 0

Use the following code for Questions 20 & 21.

```
1   double* pdata;
2   double data[] = {0.0,2.0,4.0,6.0};
3
4   pdata = data;
5   cout << *pdata;
6   pdata = &data[2];
7   cout << *pdata;
```

20. What will be output by line 5?

a. 0
b. 0246
c. 2
d. The address of `data[]`
e. Code does not compile

21. What will be output by line 7?

a. 0246
b. 2
c. 4
d. The address of `data[2]`
e. Code does not compile

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

```
1   int func5(int x[], int n) {
2       int xx = 0;
3       for(int i = 1; i < n; i++)
4           xx += x[i];
5       return xx;
6   }
7   int main() {
8       int numbs[] = {3,4,5,6};
9       cout << func5(numbs,4);
10      cout << (sizeof numbs)/(sizeof numbs[0]);
11  }
```

22. What will be output from line 9?

a. 18 b. 4 c. 22 d. 16 e. 15

23. What will be output from line 10?

a. 2 b. 4 c. 6 d. 8 e. 10

24. Which of the following is equivalent to the statement on line 4?

a. `x[i] = xx + x[i];`
b. `xx = xx++;`
c. `xx = xx + x[i];`
d. `xx = xx + x[i] + x[i];`
e. None of the above.

Use the following code for Questions 25, 26, 27, & 28.

```
1     struct R {
2        int l;
3        int t;
4        int r;
5        int b;
6     };
7     long func1(R& a);
8     void func2(R& a, int x, int y);
9     int main(void) {
10       R y;
11       y.l = 70;
12       y.t = 10;
13       y.r = y.l + 25;
14       y.b = 30;
15       cout << func1(y);
16       func2(y, 10, 90);
17       cout << y.l << "," << y.t << "," << y.r << "," << y.b;
18       cout << func1(y);
19       return 0;
20    }
21    long func1(R& a) {
22       return (a.r - a.l)*(a.b - a.t);
23    }
24    void func2(R& a, int x, int y) {
25       int ll = a.r - a.l;
26       int ww = a.b - a.t;
27       a.l = x;
28       a.t = y;
29       a.r = x + ll;
30       a.b = y + ww;
31       return;
32    }
```

25. What will be output from line 15?

a. 400 b. 600 c. 1000 d. 700 e. 500

26. What will be output from line 17?

a. 10,90,35,110
b. 10,90,70,80
c. 30,40,70,80
d. 30,40,35,110
e. None of the above.

27. What will be output from line 18?

a. 400 b. 600 c. 1000 d. 700 e. 500

28. How many function prototypes are in the block of code?

a. 1 b. 2 c. 4 d. 10 e. None of the above.

Use the following code for Questions 29 & 30.

```
1     template<class T> T func1(T x[], int y) {
2        T xx = x[0];
3        for(int i=1; i<y; i++)
4           if(xx<x[i])
5              xx = x[i];
6        return xx;
7     }
8     int main(void) {
9        int f[] = { 1,24,34,22};
10       char g[] = {'a','b','c','d'};
11       cout << func1(f, 4);
12       cout << func1(g, 4);
13       return 0;
14    }
```

29. What will be output on line 11?

a. 1 b. 24 c. 34 d. 22 e. Will not work with this data type.

30. What will be output on line 12?

a. a b. 24 c. c d. d e. Will not work with this data type.