

2021 Academic Challenge Regional Computer Science Exam

1. What is the characteristic of a “strongly-typed” language?
 - a. Each variable and constant is defined to be of a specific type and functions and operators only accept arguments of a specific type.
 - b. All variable functions arguments must be explicitly specified and not inferred.
 - c. Variable names must appear in bold typeface in a program.
 - d. Function names must appear in bold typeface in a program.
 - e. Both variable names and function names must appear in bold typeface in a program.
2. Convert the hexadecimal represented number 2FE to decimal representation.
 - a. 298
 - b. 322
 - c. 484
 - d. 766
 - e. 962
3. Which expression is equivalent to $A \cdot (\bar{B} + C)$?
 - a. $\overline{A + (\bar{B} \cdot C)}$
 - b. $\bar{A} \cdot (B + \bar{C})$
 - c. $\bar{A} \cdot (B + \bar{C})$
 - d. $A + (\bar{B} \cdot C)$
 - e. $\bar{A} + (B \cdot \bar{C})$
4. In an eight bit two’s complement integer representation, what is the range of decimal integer numbers that can be represented?
 - a. -8 to +7
 - b. -7 to +7
 - c. 0 to 255
 - d. 0 to 256
 - e. -128 to 127
5. What is the 8-bit expression for the two’s complement representation of decimal -69?
 - a. 11000101
 - b. 10111010
 - c. 10111011
 - d. 10001010
 - e. 10001010
6. In an eight bit one’s complement integer representation, $A = 10101111$ and $B = 00110010$. What is the decimal representation of $A + B$?
 - a. +3
 - b. +175
 - c. +225
 - d. -107
 - e. -30

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7. Array A is defined by

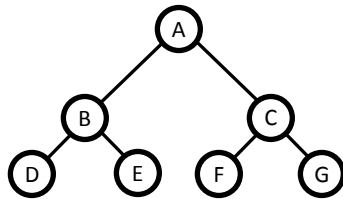
```
int A[3][4]
and it holds the values
```

1	2	3	4
5	6	7	8
9	10	11	12

What is the value of A[7] ?

- a. 7 b. 8 c. [2][3]
- d. No value, because the expression is illegal without a second index.
- e. No value, because the index is out of range.

8. An inorder traversal of the binary tree below would result in what sequence?



- a. ABCDEFG b. ACBGFED c. ABDECFG d. DBEAFCG e. GCFAEBD

9. Which of the following is a scalar data type?

- a. pointer b. array c. class d. function e. operator

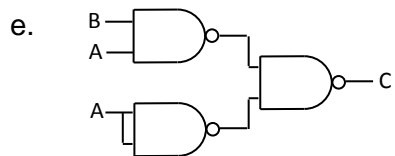
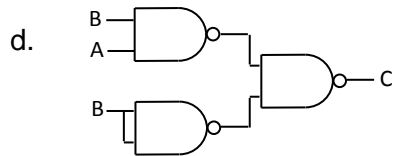
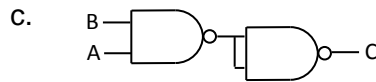
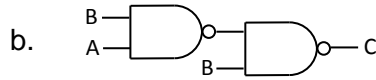
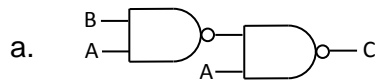
10. Which is a correct sum products expression for the following logic function?

input A	input B	output C
0	0	1
0	1	0
1	0	1
1	1	1

- a. $\bar{A} \cdot \bar{B} + \bar{A} \cdot B + A \cdot B$ b. $\bar{A} \cdot B$ c. $\bar{A} + \bar{B} \cdot A + \bar{B} \cdot A + B$
- d. $(\bar{A} + \bar{B}) \cdot (A + \bar{B}) \cdot (A + B)$ e. $\bar{A} \cdot \bar{B} + A \cdot \bar{B} + A \cdot B$

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11. If restricted to NAND gates, which of the following is a minimal gate structure to implement the function in problem #10?



12. Using the private access specifier for attributes and methods of a class, best implements object oriented programming characteristic of ?

- a. scalability b. inheritance c. encapsulation d. abstraction e. polymorphism

13. What does URL stand for?

- a. Uniform Resource Locator
b. Upload Register Location
c. Unit Random Loop
d. Unused Remaining Logic
e. None of the above

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14. Convert the decimal number 479 to hexadecimal representation.

- a. 1DF b. FE c. F1F d. 1ED e. 1F3

15. A computer architecture with different memory space and signal paths for program storage and data storage is called a/an _____ Architecture

- a. Von Neumann
b. Harvard
c. Divergent
d. IBM
e. Intel

16. A *program counter* is a CPU register that holds what information?

- a. the total memory size needed to hold the current program
b. the total number of instructions in the current program
c. the current internal count of the current loop structure being processed
d. information to locate the next instruction to be processed
e. the number of clock cycles the current program has processed

17. What is the console output for the following code?

```
#include <iostream>
using namespace std;

int main()
{
    int i;
    int j = 1;
    for (i = 0; i < 5; ++i)
    {
        j = j + i;
        cout << j;
    }
}
```

- a. 1234 b. 12345 c. 013610 d. 01361015 e. 124711

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18. For the code in problem 17, what is the last value of the variable *i* before the execution is complete?

- a. 1 b. 2 c. 3 d. 4 e. 5

19. What is the console output for the following code?

```
1    #include <iostream>
2    using namespace std;
3
4    int square(int i)
5    {
6        int k;
7        k = i * i + 1;
8        return k;
9    }
10
11   int main()
12   {
13       int i = 1;
14       int j = 2;
15       int m;
16       m = square(j);
17       cout << m;
18   }
```

- a. 2 b. 3 c. 4 d. 5 e. 6

20. For the code in problem 19, which line could be deleted and the console output remain the same?

- a. 6 b. 8 c. 13 d. 14 e. 15

21. For the line of code below, what will be the value of *k* after execution of that line if *i* = 2 and *j* = 3 ?

```
k = i * j + 10 / 2 - 3;
```

- a. -12 b. -4 c. 5 d. 8 e. 13

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22. What is the console output of the following code?

```
1   #include <iostream>
2   using namespace std;
3
4   class triangle {
5   private:
6       float side1;
7       double angle;
8       float side2;
9   public:
10      triangle(float, float, double);
11      double area(void) {
12          return side1 * side2 * sin(angle) / 2;
13      }
14  };
15
16  triangle::triangle(float s1, float s2, double a) {
17      side1 = s1;
18      side2 = s2;
19      angle = a * 3.14159 / 180;
20  }
21
22  int main()
23  {
24      triangle c(3, 5, 36.869);
25      cout << c.area();
26  }
```

- a. 4.4999 b. 7.5 c. 8.9999 d. $3*5*\sin(36.869)/2$ e. $side1 * side2 * \sin(angle) / 2$

23. In the code in problem 22, what kind of function is the `triangle` function?

- a. recursive b. constructor c. polymorphic d. hybrid e. external

24. Which line of code could be added to `main` to output the `angle` value of the object `c`?

- a. `cout << c.angle;`
b. `cout << c.area/c.side1;`
c. `cout << c(angle);`
d. `cout << c[angle];`
e. that value is inaccessible in the function `main`.

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25. What is the console output for the following code?

```
#include <iostream>
using namespace std;

int functionA(int k) {
    int i;
    i = k;
    return i;
}

int main()
{
    int i;
    int j;
    int k;
    int m;
    i = 1;
    j = 2;
    k = 0;
    m = functionA(j);
    cout << m;
    cout << i;
}
```

- a. 10 b. 12 c. 20 d. 21 e. 22

26. What is the console output for the following code?

```
#include <iostream>
using namespace std;

class A {
public:
    string K = "Hello";
};

class B : public A {
public:
    string L = "Goodbye";
};

int main() {
    B myB;
    cout << myB.L + " " + myB.K;
    return 0;
}
```

- a. Hello Goodbye b. Goodbye Hello c. Hello d. Goodbye
e. The code will not compile because K is not part of class B

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27. In the code of problem 26, the code `class B : public A` is an example of using

- a. overloading b. encapsulation c. inheritance d. a method e. abstraction

28. In the code below, what code could be added to replace the _____ in line 22 so that the console output is the value of the Volume attribute of myObj ?

```
1   #include <iostream>
2   using namespace std;
3
4   class Shape {
5   private:
6       float Volume;
7   public:
8       void setVolume(float s) {
9           Volume = s;
10      }
11      float getVolume() {
12          return 0;
13      }
14      float setV() {
15          return Volume;
16      }
17  };
18
19  int main() {
20      Shape myObj;
21      myObj.setVolume(3.0);
22      cout << _____;
23      return 0;
24  }
```

- a. `myObj.Volume` b. `myObj.setVolume(?)` c. `myObj.getVolume()` d. `myObj.setV()`
e. The Volume attribute of myObj is not accessible because it's access specifier is private

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29. What is the console output for the following code?

```
1     #include <iostream>
2     using namespace std;
3
4     int function1(int) {
5         return 0;
6     };
7
8     int function1(float) {
9         return 1;
10    };
11
12    int function1(char) {
13        return 2;
14    };
15
16    int main()
17    {
18        cout << function1('1');
19    }
```

- a. 0 b. 1 c. 2 d. function('1')
- e. code will not compile because of the multiple definitions of function1.

30. The multiple definitions of function1 in the code in problem 29 is an example of

- a. function duplication b. function copying c. function reuse d. function overloading
- e. illegal duplicate function naming