**ACSL**

**American Computer Science League**

#### All-Star

**2012 - 2013**

### Short Round Questions

A. 1

B. *A B C*

C. 

D. 0

E. None of the above

1. **Boolean Algebra**

Simplify the following Boolean expression:

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**2. Digital Electronics**

How many ordered quadruples make the following circuit

TRUE?



A. 2

B. 6

C. 10

D. 14

E. None of the above

**3. Prefix-Infix-Postfix**

Define: **a # b** = GCF of a and b (Greatest Common Factor of a and b)

**a % b** = LCM of a and b (Least Common Multiple of a and b)

**a!** = a\*(a-1)\*(a-2)\*…3\*2\*1

Evaluate the following postfix expression: (all single digits)

**5 8 % 2 3 8 4 # # + \* 4 6 8 # # 2 3 ↑ / \* 6 ! 3 8 % / +**

A. 22

B. 70

C. 95

D. 250

E. None of the above

1. **Computer Number Systems**

Find the digit X that satisfies the following:

X6148 + X5016 = 201210

A. 4

B. 3

C. 2

D. 1

E. None of the above

A. \*\*010

B. \*010\*

C. 010\*\*

D. \*0\*10

E. None of the above

**5. Bit-String Flicking**

Which value(s) of X (five bits long) solve the following equation?

**NOT(LCIRC-2 11101) OR RSHIFT-1 01011 AND**

**RCIRC-1(LSHIFT-2 01101) = LSHIFT-2 (RCIRC-2 X)**

1. **What Does This Program Do?**

What is the output after this program is executed?

A. 45

B. 55

C. 56

D. 66

E. None of the above

for i = 1 to 5

for j = 1 to 5

a(i,j) = 2\*i + j

next j

next i

for i = 1 to 5

for j = i to 5

b(i,j)= a(j,i)+2\*(j-i)

c(i,j)= b(i,j)+ i\*j

next j

next i

print a(2,4)+b(1,3)+c(4,5)

end

A. 5

B. 7

C. 9

D. 11

E. None of the above

1. **Recursive Functions**

Findgiven: 

1. **Data Structures**

Define the command AZ to put the elements of the structure in alphabetical order and the command ZA to put the elements of the structure in reverse alphabetical order. The first element in the new order is then the new "first in" element. Starting with an empty queue, what would be the next element to be popped after the following are executed:

PUSH(M), PUSH(E), PUSH(M), POP(X), PUSH(O), ZA, POP(X), PUSH(R), PUSH(I), POP(X), AZ, POP(X), PUSH(A), PUSH(L), POP(X), PUSH(D), AZ, PUSH(A), POP(X), ZA, PUSH(Y), POP(X)

A. L

B. A

C. D

D. Y

E. None of the above



A. 9

B. 13

C. 15

D. 21

E. None of the above

**9. Graph Theory**

Given the following directed

graph, how many cycles

are there from B?

A. ( 3 2 ( 1 ) )

B. ( 2 ( 1 ) )

C. ( 3 2 )

D. ( ( 1 ) 2 )

E. None of the above

1. **LISP**

(SETQ X ’( (1 2 ) 3 ( ( 4 5 ) 6 ) 7 ( 6 ( 5 4 ) ( 3 2 ( 1 ) ) ) ) )

Evaluate the following expression:

**(CDR(CAR(REVERSE(CDR(CAR(REVERSE(CDR X)))))))**

A. a, b, e

B. b, c, d

C. b, d, f

D. b, c, e, f

E. None of the above

1. **FSA and Regular Expressions**

Which of the strings below are represented by the following FSA?

 

a) 0001101001 b) 01110001011 c) 010101010

d) 0100000 e) 011001011 f) 01010010

e) +8.35 f) 5.4E-8.3

1. **Assembly Language**

What is the final value of S when the program is run?

S DC 0 LOAD X

X DC 1 SUB =10

TOP LOAD X BE DONE

MULT X LOAD X

MULT X ADD =1

STORE C STORE X

LOAD S BU TOP

ADD C DONE LOAD S

STORE S PRINT S

END

A. 1296

B. 3025

C. 2025

D. 4356

E. None of the above

1. 101011001011 d. 1011100010110010
2. 101100110101 e. 10000011111111
3. 1010001111001111111 f. 100101000