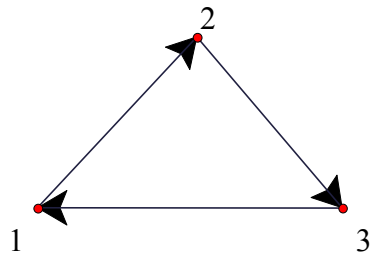
2003 National Convention **Computer Test**

1 What is the binary representation of the hexadecimal number 3B7F?

A) 0100 1001 1110 1101 B) 0011 1011 0111 1111 C) 0010 0100 0000 1010
D) 0110 0011 1011 1100 E) NOTA

2 Consider the set $\{1,2,3\}$ and the binary relation represented by the following digraph. Which of the following properties does the relation represented by this digraph have?



I. Reflexivity
II. Symmetry
III. Transitivity

A) I and II only B) I and III only C) II and III only
D) I, II and III E) NOTA

3 Let $\sum=\{a,b,c,d,e,f\}$. The number of strings in $\sum^*$ of length 4 such that no symbol is used more that once in a string is

A) 28 B) 35 C) 49 D) 360 E) NOTA

4 Consider the following regular expression $R=(ab\,|\,abb)^*bbab$

Which of the following strings is NOT in the set denoted by *R*?

A) *ababab* B) *abbbab* C) *abbabbbab*
D) *ababbabbbab* E) NOTA

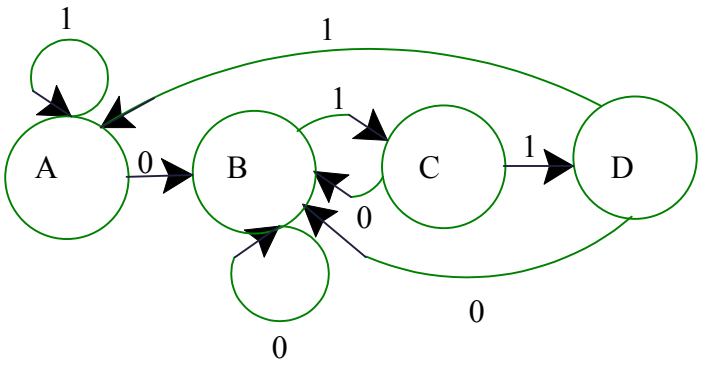
5 Consider the following c++ function where *n* is a non-negative integer:

```
int calc(int n)
{
    if (n==0)
       return 0;
    else
       return n + calc(n-1)
}
```

What value will **`calc`** return when it is invoked with *n*=8?

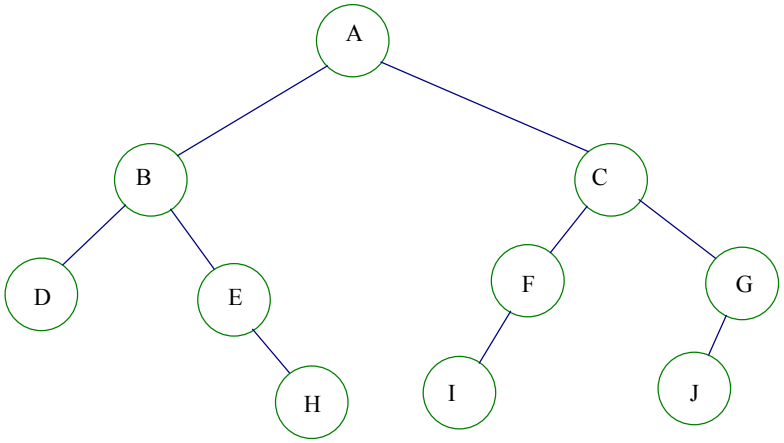
A) 0 B) 8 C) 36 D) 56 E) NOTA

6 In the figure shown, a deterministic finite automaton *M* has start state *A* and accepting state *D*. Which of the following regular expressions denotes the set of all words accepted by *M*?



A) 001 B) 10*1*0 C) 10*1*010 D) (0 | 1)* 011 E) NOTA

7 Which of the following lists of nodes correspond to a post-order traversal of the binary tree in the figure shown?



A) *ABDEHCFIGJ* B) *DHEBIFJGCA* C) *DBEHAIFCJG*
D) *ABCDEFGHIJ* E) NOTA

8 The hash function

hash = key % size

and linear probing are used to insert the keys

37, 38, 72, 48, 98, 11, 56

into a hash table with indices 0 … 6. The order of keys in the array are given by

A) 72, 11, 37, 38, 56, 98, 48 B) 11, 48, 37, 38, 72, 98, 56
C) 98, 11, 37, 38, 72, 56, 48 D) 98, 56, 37, 38, 72, 11, 48
E) NOTA

9 Consider the following c++ function.

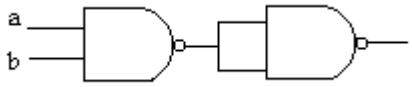
```
int f(int m, int n)
{
   if (m==0)
     return n+1;
   else
     if (m != 0) and (n==0)
       return f(m-1, 1)
     else
       return f(m-1, f(m,n-1))
}
```

What will be the value of *r* after the following line?

```
r = f(2,1);
```

A) 1 B) 3 C) 5 D) 7 E) NOTA

10 The combinational circuit given below is implemented with two NAND gates. To which of the following individual gates is it equivalent?



A) AND B) OR C) NOT D) NOR E) NOTA

11 Consider the following c++ function

```
int whosis ( int &a, int& b, int c)
{
   a++;
   b+=a;
   c-=a++;
   return a+b+c;
}
```

What would be the output from the following code fragment?

```
int a=1, b=2, c=3;
cout << whosis(b,b,c);
```

A) 11 B) 9 C) 8 D) 7 E) NOTA

12 The Boolean expression !A && B || C is equivalent to

A) !A && (B||C) B) ((!A) && B) || C C) (!A) && (B || C)
D) !(A && B) ||C E) NOTA

13 Consider the following c++ formal function header.

```
int theFunction( const someType & i)
```

A possible reason for inserting the **const** keyword in the parameter list is to

A) allow the value of the variable *i* to be changed by the function.
B) conserve memory by returning unused memory to the system.
C) allow for an increase in speed by reusing memory.
D) ALL of the above
E) NOTA

14 What value is stored in *x* after the following code is executed?

```
int x = 13 - 3 * 6 / 4 % 3;
```

A) 13 B) 12 C) -5 D) -1 E) NOTA

15 What is the output from the following code?

```
int x = 7 / 3;
if ( x = 3)
    cout << x;
else
   cout << x * 3;
```

A) 3 B) 6 C) 7 D) 18 E) NOTA

16 What values are stored in *x* and *y* following the execution of the following program segment?

```
int x=30, y=40;
if (x >= 0)
{
   if (x <= 100)
   {
      y = x*3;
      if ( y < 50)
        x /= 10;
   }
   else
      y = x*2
}
else
  y = - x;
```

A) x =30 y =90 B) x = 30 y = -30 C) x = 30 y = 60
D) x = 30 y = 40 E) NOTA

17 Which statement about function declarations are true?

I. void functions that don't take arguments do not need declarations
II. Declarations of functions invoked in main() may be listed before or after the main() function.
III. Declarations of standard library functions are supplied in header files.

A) I only B) II only C) III only D) I and III only E) NOTA

18 Consider the following BASIC function.

```
Function Qwerty(N as Integer) as Integer
  Dim A(100) as Integer
  Dim K as Integer

  A(0) = 1
  A(1) = 1
  For K = 2 to N
    A(K) = A(K-1) + A(K-2)
    Next K
  Qwerty = A(N)
```

What is the value of `Qwerty(10)`?

A) 21 B) 34 C) 55 D) 89 E) NOTA

19 Consider the following function

```
Function TrueOrFalse(A As Integer, B As Integer) As Boolean
  If (A<>B) Then
    TrueOrFalse = A > B
  Else
    If (A>B) Then
      TrueOrFalse = A > B
    Else
      TrueOrFalse = A < B
    End If
  End If
End Function
```

Which of the following function calls will return `true`?

A) TrueOrFalse(5,6) B) TrueOrFalse(7,7) C) TrueOrFalse(6,5)
D) TrueOrFalse(0,0) E) NOTA

20 A location in a computer's memory which is used to store data is called

A) an integer B) a character string C) a file D) a variable E) NOTA

21 In Visual BASIC, clicking on a command button is an example of

A) an object B) a property C) an event D) a value E) NOTA

22 Assume the following BASIC definitions have been made.

```
Const MAX = 15
Dim List(MAX) as Integer
Dim K as Integer
Dim T as Integer
```

What is the condition of `List` after the following code is executed?

```
For K = 1 to MAX - 1
  If List(K) > List(K+1) Then
    T = List(K)
    List(K) = List(K+1)
    List(K+1) = T
    End If
  Next K
```

A) `List` is sorted in ascending order
B) `List` is sorted in descending order
C) The elements in the `List` are reversed
D) The largest element is located in `List(MAX)`
E) NOTA

23 Suppose the following data is stored in an array named `List`.

```
 3 6 9 12 15 18 21 24 27
```

What is the contents of List after the execution of the Sub Alter?

```
Sub Alter(List() As Integer, N As Integer)
  Dim K as Integer
  For K = 0 to N
    List(K) = List(K) / List(0)
    Next K
End Sub
```

A) `3 6 9 12 15 18 21 24 27`
B) `1 2 3 4 5 6 7 8 9`
C) `1 1 1 1 1 1 1 1 1`
D) `1 6 9 12 15 18 21 24 27`
E) NOTA

24 Perform the following addition in base 8. Write your answer in base 8.

```
 3141
+2677
```

A) 5010 B) 5818 C) 6040 D) 6140 E) NOTA

25 In Visual BASIC, what is the final value of *S* at the completion of this Sub?

```
Private Sub cmdI88_3_Click()
  Dim Num As String
  Dim L As Integer
  Dim S As Integer
  Dim T As Integer
  Dim J As Integer
  Dim X As Integer

  Num = "4135"
  L = Len(Num)
  S = 0
  T = 8
  For J = 1 to L
    X = Val(Mid$(Num, J, 1))
    S = S + X * T ^ (L - J)
    Next J
End Sub
```

A) 2141 B) 4135 C) 5314 D) Error in Program E) NOTA

26 A list of numbers is stored in a sorted array. It is required that the list be maintained in sorted order. This requirement leads to inefficient execution for which of the following processes?

I. Summing the five smallest numbers in the list.
II. Find the maximum value in the list.
III. Inserting a new number.

A) I only B) III only C) II and III only D) I, II, and III E) NOTA

27 An algorithm sequentially examines a list of *n* random integers and then outputs the number of times 4 occurs in the list. Using big-O notation, this algorithm is

A) $O(1)$

B) $O(4)$

C) $O(n)$

D) $O(n^2)$

E) NOTA

28 In Visual BASIC what is the output from the following command?

```
Dim x As Integer
x = 2 = 3 = 4 = 5 = 0
Print x
```

A) -1 B) 0 C) 5 D) A syntax error is generated E) NOTA

29 Consider the following declaration

```
struct Address
{
     apstring name;
     apstring street;
     apstring city;
     apstring state;
     int zip;
};
apvector<Address> a(100);
```

Which of the following code segments prints out a list of addresses?

```
 I.  for (int i = 0; i<100; i++)
        cout << a[i].Address << endl;
II.  for (int i=0; i<100; i++)
        cout << a[i] << endl;
III. for (int i = 0; i <100; i++)
      {
         cout << a[i].name << endl;
         cout << a[i].street << endl;
         cout << a[i].city << endl;
         cout << a[i].state << endl;
         cout << a[i].zip << endl;
      }
```

A) I only B) III only C) II and III only D) I and III only E) NOTA

30 Consider the code segment

```
char a1, a2;
int n;
cin >> a1 >> a2 >> n;
```

Suppose the user inputs "B<space>3<carriage return>4"
i.e.
B 3\n
4

Which represents the variable contents after execution of the code segment?

A) `a1 = 'B', a2 = ' ', n = 3`
B) `a1 = 'B', a2 = '3', n = 4`
C) `a1 = 'B', a2 = '3', n = 4`
D) `a1 = 'B', a2 = ' ', n = undefined`
E) NOTA