1. B 3B7F
   Translate each digit
   3 = 0011
   B = 1011
   7 = 0111
   F = 1111

2. E A relation R is
   reflexive if for all x xRx
   symmetric if xRy \(\Rightarrow\) yRx
   transitive if xRy and yRz \(\Rightarrow\) xRz
   None of these hold

3. D if items can’t be used more than once
   then there are 6 ways choose 1st
   5 for 2nd, 4 for 3rd and 3 for 4th
   thus (6)(5)(4)(3)=360

4. A \(R = (ab | abb)*bbab\)
   The first part means
   \(ab\) OR \(abb\) and the \(*\) means repeated
   as many times as desired.
   \(bbab\) means that the expression must
   end with 1 occurrence of \(bbab\).
   A) does not end it \(bbab\).

5. C recursive function that SUMS all the
digits from 8 downto 0
   \((8)(9)/2 = 36\)

6. D Choices B and C can be eliminated
   immediately since each word must end
   in a 1 (when you enter D)
   A is legal, but doesn’t handle all the
   possible alternate paths. One such
   path is 1011.

7. B
   Draw a path around the tree. every
   time you see a node for the LAST
   time, write down its value

8. D 37, 38, 72, 48, 98, 11, 56
   Size of storage array is 7 (0..6)
   then each number must be MOD ed by
   7
   37 mod 7 = 2  37 in pos 2
   38 mod 7 = 3  37 in pos 3
   72 mod 7 = 2 * collision in 2 and 3
   72 in pos 4
   48 mod 7 = 6  48 in pos 6
   98 mod 7 = 0  98 in pos 0
   11 mod 7 = 4 *collision in 4
   11 in pos 5
   56 mod 7 = 8 *collision 0
   56 in pos 1
   98 56 37 38 72 11 48

9. C First note that \(f(0,n) = n + 1\)
   \(f(2,1)=\)
   \(f(1,f(2,0))=\)
   \(f(1,f(1,1))=\)
   \(f(1,f(0,f(1,0)))=\)
   \(f(1,f(0,2))=\)
   \(f(1,3)=\)
   \(f(0,f(1,2))=\)
   \(f(0,f(0.f(1,1)))=\)
   \(f(0,f(0, f(0, f(1,0))))=\)
   \(f(0,f(0,f(0,f(0,1))))=5\)

10. A Translate circuits to Boolean
    \(a \land b \land a \land b \leftrightarrow\)
    \((a \land b) \lor (a \land b) \leftrightarrow\)
    \(a \land b\)
    Same as AND
<table>
<thead>
<tr>
<th>Solution</th>
<th>Description</th>
</tr>
</thead>
</table>
| 11 A | int whosis (int &a, int &b, int c)  
{  
a++;  
b+=a;  
c-=a++;  
return a+b+c;  }
| 15 A | the line x = 3 does two things. First it sets x to 3. Then it returns the value 3 so that the if statement evaluates to true.  
output is 3 |
| 12 B | !A && B || C  
the order of operations is NOT, AND then OR  
so (!(A) && B) || C |
| 13 E | A. allow the value of the variable i to be changed by the function.  
NO const does NOT permit changes  
B) conserve memory by returning unused memory to the system. NO  
Memory is conserved by using the &, but no memory is returned.  
C) allow for an increase in speed by reusing memory.  
NO again a function of the & |
| 14 B | the operations * / and % all have the same precedence so the expression is evaluated like  
13 - (((3 * 6) / 4) % 3)  
18 / 4 = 4  
4 % 3 = 1  
13 -1 = 12 |
| 16 A | 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;  
since x >= 0 first if is done. The last else is not done double  
since x <=100 the second else is not done double  
x*3 makes y=90 so the following if is skipped single bold  
answer is x=30 y=90 |
| 17 C | I. ALL functions need headers NO  
II. functions must be declared BEFORE they are used. NO  
(even though most of a function can be listed after main, the prototype is the declaration and must come first).  
III. TRUE  
III only |
| 18 D | This program calculates the (N+1)th fibonacci number  
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89 |
19 C
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

If A>B TRUE is returned by the first Then
If A=B A<B (false) is returned by the second else
If A < B (same as =)
TrueOrFalse(6,5)

20 D A,B are examples not the most general case. A file is usually stored on some type of auxiliary storage.
D. Variable

21 C event

22 D This is the “inside” loop of a bubble sort. There is a single traversal and at each step if the first element is bigger
it is swapped with the next one

23 E The first step changes List(0) to 1 (List(K) / List(0))
From that point everthing is divided by 1 so there are no other changes.

24 C
\[
\begin{align*}
3 & \quad 141 \\
+ & \quad 2677 \\
\end{align*}
\]
\[
\begin{align*}
1+7 &= 8 \text{ which is 10 in base 8} \\
& \quad \text{put a } 0 \text{ and carry 1} \\
(1) + 4 + 7 &= 12 \text{ which is 14 in base 8} \\
& \quad \text{put a } 4 \text{ and carry 1} \\
(1) + 1 + 6 &= 8 \text{ (10 in base 8} \\
& \quad \text{put a } 0 \text{ and carry 1} \\
(1) + 3 + 2 &= 6 \\
& \quad 6040
\end{align*}
\]