1. Graph Theory

The adjacency matrix is :

0	1	1	0	1
0	0	1	0	1
1	0	0	1	0
1	0	1	0	1
0	0	1	1	0

1. 12

2. Graph Theory

The cycles are: ABA, ACA, ADA, ABCA, ADCA.

2. 5

3. Digital Electronics

The circuit translates to: $\overline{A(A+B)}$

$\overline{A(A+B)}$

$= \overline{A} + \overline{(A+B)}$

$= \overline{A} + \overline{A}\,\overline{B}$

$= \overline{A}(1 + \overline{B})$

$= \overline{A}$

3. $\overline{A}$
   or NOT A
   or ~A

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4. Digital Electronics

The circuit translates to:

$$\overline{A\,B + (B + C)}\ \left((B + C)\,\overline{CD}\right)$$

$$\overline{AB + (B+C)}\left((B+C)\,\overline{CD}\right) = 1$$

$$\Rightarrow \overline{AB + (B+C)} = 1 \ \wedge\ \left((B+C)\,\overline{CD}\right) = 1$$

$$\Rightarrow (AB = 0 \ \wedge\ B+C = 0) \ \wedge\ (B+C = 1 \ \wedge\ CD = 0)$$

$$\Rightarrow B + C = 0 \ \wedge\ B + C = 1 \ \textit{which is impossible}\,.$$

4. 0

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5. What Does This Program Do? - Strings

A = "HARTFORDISTHEINSURANCECAPITALOFTHEWORLD"
The first loop forms B - letters alphabetically before I.
    B = "HAFDHEACECAAFHED"
The second loop forms C - letters alphabetically after O.
    C = "RTRSTSURPTTWR"
Drop A's and E's in B to form D = "HFDHCCFHD".
Drop R's and T's in C to form E = "SSUPW".
F is formed by alternating corresponding positions in D and E
    for the length of the shorter.   F = "HSFSDUHPCW".
There are 8 unique letters in F: H, S, F, D, U, P, C, W

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