American Computer Science League

CLASSROOM DIVISION

|	
1. Graph Theory Draw the directed graph with the set of vertices {A, B, C, D, E} and the set of edges {AB, DA, BC, AE, BE, CA, DE, EC, BD, CE}.	**1.**
2. Graph Theory Draw the adjacency matrix for the directed graph at the right.	**2.**
3. Digital Electronics Simplify the Boolean expression representing the digital circuit at the right.	**3.**
4. Digital Electronics How many ordered triples make the Boolean expression for this circuit FALSE?	**4.**

5. What Does This Program Do?
What is the output when this program is run?
A = "NARRAGANSETTINDIANS": B = "": C = ""
for x = 0 to len[A] − 1
    if A[x] != "T" && A[x] > "H"
        B = B + A[x]
    end if
next x
for y = 0 to len[B] − 1
    if B[y] != "N" && B[y] != "S"
        C = C + B[y]
    end if
 next y
print C[:1] + C[1:]
end
	5.
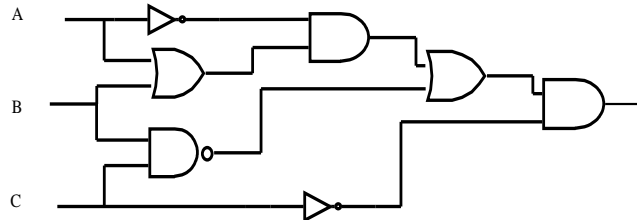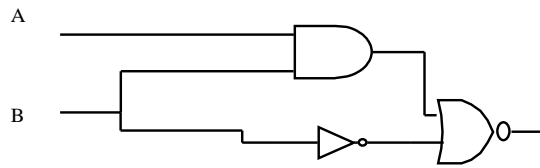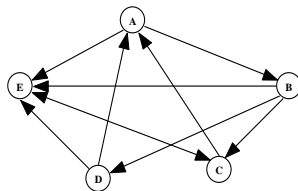
6. Graph Theory

How many paths of length 2
are there in the directed graph
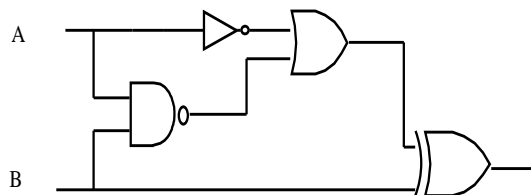at the right?
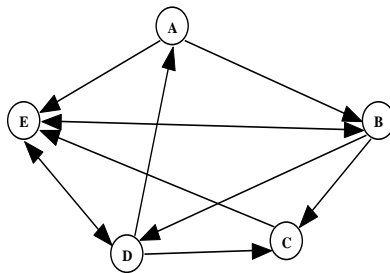
7. Graph Theory

How many cycles exist in
the directed graph at the
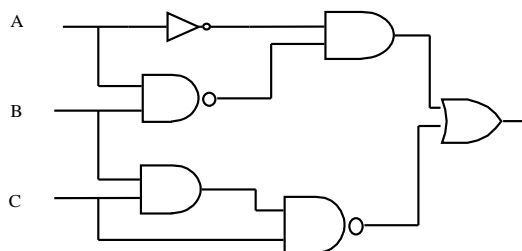right?
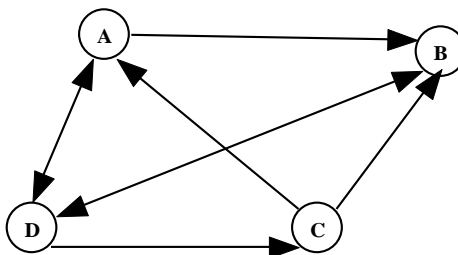
8. Digital Electronics

Simplify the Boolean
expression represented
by the digital circuit at
the right.

9. Digital Electronics

Which ordered triple(s) make
the digital circuit at the
right FALSE?

6.

7.

8.

9.

10. Assembly Language

10.

What is the sum of the outputs of the following assembly program after it is executed?

```
        A    DC    4213
        B    DC    16
TOP     LOAD   A
        DIV    B
        STORE  C
        BE     DOWN
        LOAD   C
        MULT   B
        STORE  E
        LOAD   A
        SUB    E
        STORE  F
        PRINT  F
        LOAD   C
        STORE  A
        BU     TOP
DOWN    PRINT  A
        END
```