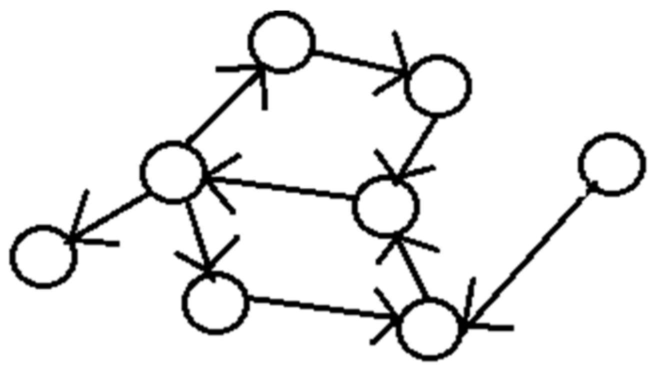
Quiz 9 Name________________________________

Describe an algorithm to accept as input a positive integer $\lambda \geq 3$ and an adjacency array *E* of a directed graph,

$$E[i,j] = \begin{cases} 1, \text{if } v_i v_j \in E \\ 0, \text{if } v_i v_j \notin E \end{cases}$$

which will return the number of cycles of length exactly $\lambda$ in the graph. Your algorithm should work in time $O(\lambda n^3)$. So, for example, your algorithm would return 2 for $\lambda$ =4 and digraph



<u>SOLUTION</u>: $A \leftarrow I$ $O(n^2)$

**for** $i \leftarrow 1$ **to** $\lambda$ **do** $A \leftarrow A * E$ $O(\lambda n^3)$

$NumCycles \leftarrow 0$ $O(1)$

**for** $i \leftarrow 1$ **to** *n* **do**

$NumCycles \leftarrow NumCycles + A[i,i]$ $\Theta(n)$

**return** $NumCycles / \lambda$ $O(1)$

We note that each cycle is counted $\lambda$ times, once for starting at each vertex on the cycle.