BFS - Exam Question

🟩 : input

🟪 : output

/ 4 P c) *Finding a shortest cycle*

Describe an algorithm which, given an unweighted directed graph $G = (V, E)$ and a vertex $v \in V$, finds a shortest cycle containing v. If there is no such cycle, the algorithm should report that v is not a vertex of any cycle. Faster algorithms are worth more points. To get full points, aim for $O(|V| + |E|)$ runtime.

DFS or BFS

Given G and v∈V

We start the BFS from v

If we don't encounter v for a second time , output "v is not a vertex of any cycle "

If we encounter v for a second time ,

Let u be the vertex from which we've reached v
let P be the shortest path from v to u (already found by BFS)

Adding edge (u,V) to P will give us a shortest cycle containing v .