BFS: How to find the shortest path?

Find the processor for each one

$$A \rightarrow C \rightarrow D \rightarrow F \rightarrow J$$

processor
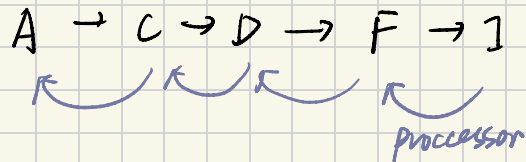
$$O(N+M)$$

→ line 8 enqueues
→ line 8 runs if line 7 condition is true, $\quad$ J, 8, 9
$\quad$ so only if V is not seeen $\quad\quad\quad\quad$ → n times.

→ line 9 immediately marks v seen

⇒ Therefore, V is enqueued _once_.

line 6: edge $\{u, v\}$ ⇒ $\underline{\underline{2m}}$ times

$\quad\quad\quad$ consider

$\quad\quad u: \text{...} \ v \text{...}$ ⇒ twice (for undirected graph).

$\quad\quad v: \text{---} \ u \text{---}$

⇒ Total time for BFS: $\Theta(|V|+|E|)$.

$\quad\quad\quad\quad\quad\quad\quad\quad\quad n + 2m$

DFS:

$\quad$ final time ⇒ $\underline{2 \cdot |V|}$