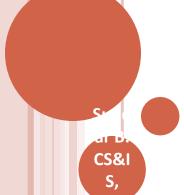
CS F364 Design & Analysis of Algorithms



Graph Problems:

Transitive Closure



GRAPHS - TRANSITIVE CLOSURE

- A graph G = (V,E) captures a binary relation R on a set S:
 - i.e. V = S and $E = R \subseteq S \times S$
 - i.e. the edge relation of G models R
- The transitive closure of R, denoted R* is defined as:

```
ox R* x for any x in S
ox R y ==> x R* y for any x and y
```

- ox R y and y R z ==> x R* z for any x, y, and z
- i.e. the path relation in G models R*

GRAPHS — TRANSITIVE CLOSURE

- Question:
 - How similar is this problem to All Pairs Shortest Paths (APSP)?
 - Note:
 - This is not an optimization problem!

GRAPHS — TRANSITIVE CLOSURE

• Exercise:

Rewrite the recurrence for APSP to suit this problem:



