Jol 9 — 180

Def 6 Root of a tree

Def 7 Parent - child

ancestor - decendent

If V_1 is a parent of V_2 & V_2 is ancestor of V_3

then V_1 is ancestor of V_3

proposition 1 If a tree has n nodes, then it has $n-1$ edges

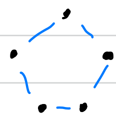
$n-1$ childs $\Rightarrow$ $n-1$ edges

proposition 2 $g = (V, E)$ $|V| = n$

1) g is connected

2) g has no cycles

3) $|E| = n-1$



$n = 5$

$|E| = 5$

Def 8 s-t connectivity

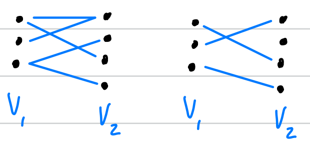
$s, t \in V$ g is s-t connected if $\exists$ path from s to t

Def 9 Independent set $X \subseteq V$

$\forall\, u, v \in X$ $\neg (u, v) \in E$

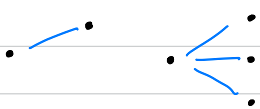
Def 10 Biparte graph g

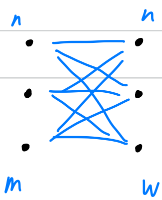
$V = V_1 \cup V_2$ & V_1, V_2 are independent sets



Def 11 Matchings in biparte graps g

Def 12 Degree of a node

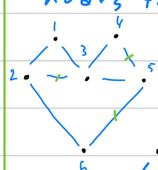


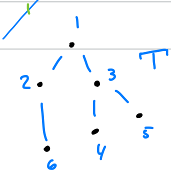


Def 13 Spanning tree of g

is a tree that includes all

nodes from g & subgraph





$R_1 = \{1\}$

$R_2 = \{1, 2, 3\}$

$(1,2)$, $(1,3)$

$R_3 = \{1, 2, 3, 4, 5, 6\}$

$(1,2), (1,3), (2,6), (3,4), (3,5)$

$G = (V, E)$

problems

1) Find $v \in V$ with property P $\quad P(v) = 1$

2) Find connected component $\quad P(u) = 0$

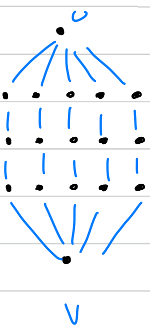
   comp of $v \in V$

3) Check $v - u$ connectivity

Breadth-first search (BFS)

Depth-first search (DFS)

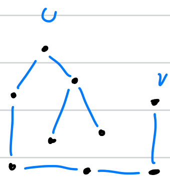
Depth-first



DFS - 4 st

BFS - 16 st

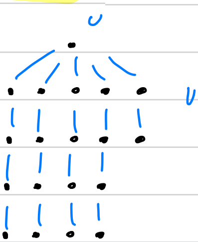
$P(v) = 1$



DFS - 5 st

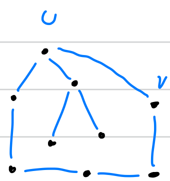
BFS - 8 st

Breadth-first



BFS - 5 st

DFS - 16 st



BFS - 3 st

DFS - 5 st

when $\exists$ $u - v$ path ...???

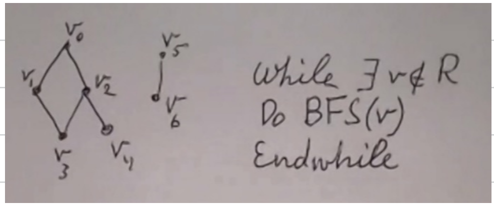
only for connected graph

$g = (V, E)$

R is the set of tested vertices

BFS

for disconnected graph



$R = \{ v_0 \}$ $\quad v_0 \in V$

while $\exists (u, v) \in E$ with $u \in R$ & $v \notin R$

Do $A(v)$ & $v \in R$

End While

$\exists w \in C_g(v_0)$ but $w \notin R$

path from v_0 to w

$v_1, v_2, \dots, w$

$v_i \in R$ & $v_{i+1} \notin R$

tests all vertices in the connected component v_0

DFS

DFS (u):

Mark u exp(u) & $u \in R$ & $A(u)$

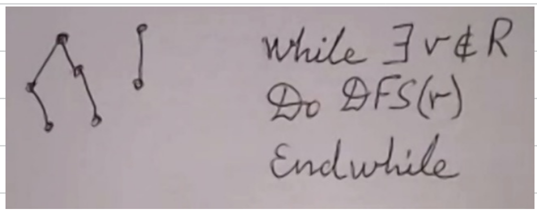
For $\forall (u, v) \in E$

If $v \neq$ exp(u)

then Rec DFS(v)

End if

End for



Def 14 Spanning forrest of g