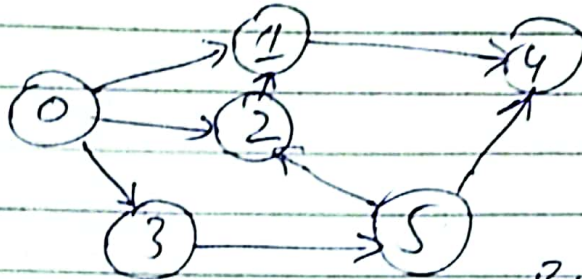


Uninformed Searches

DFS



Start = 0
Goal = 5

By lexicographic

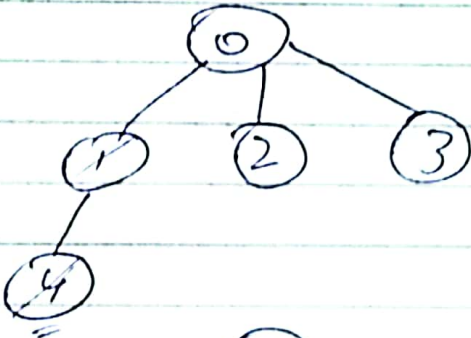
A 1
B 2
C 3

Tree Method

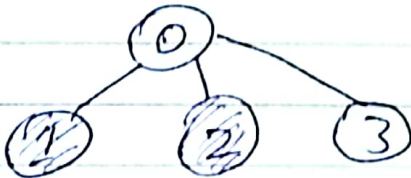
(a)



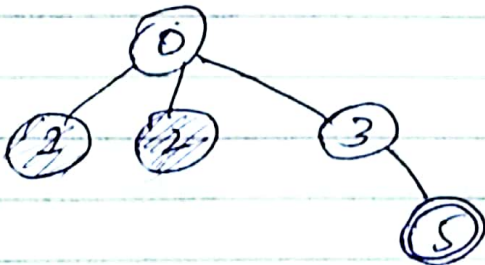
(b)



(c)



(d)

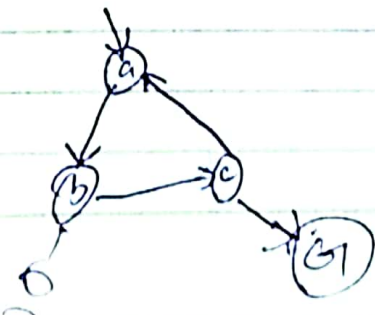


S
3
0

DFS Frontier Path

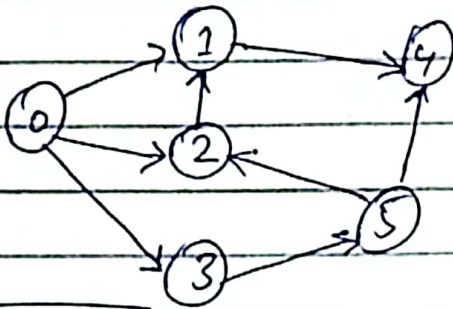
(0)
(0,1)(0,2)(0,3)
(0,1,4)(0,2)(0,3)
(0,2)(0,3)
(0,2,1)(0,3)
(0,2,1,4)(0,3)
(0,3)
(0,3,5) ✓
Goal

Complete? No → (Cycle)
Optimal? No
Time? $O(b^m)$
Space? $O(b.m)$



Frontier & Queue.

BFS



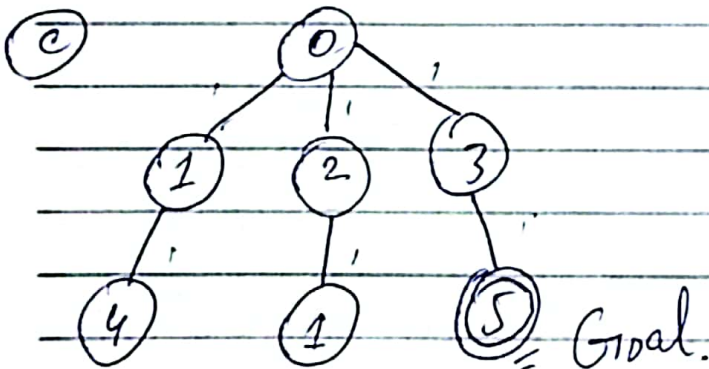
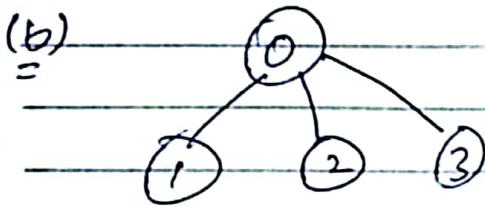
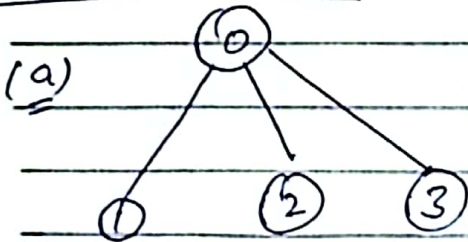
Start: 0

Goal: 5

lexicographic

a c b

BFS Tree Traversal



BFS Frontier

(0)

(0,1) (0,2) (0,3)

(0,2) (0,3) (0,1,4)

(0,3) (0,1,4) (0,2,1)

(0,1,4) (0,2,1) (0,3,5)

Goal.

d: depth

b: branching factor.

Complete? Yes (No if branching factor is infinite)

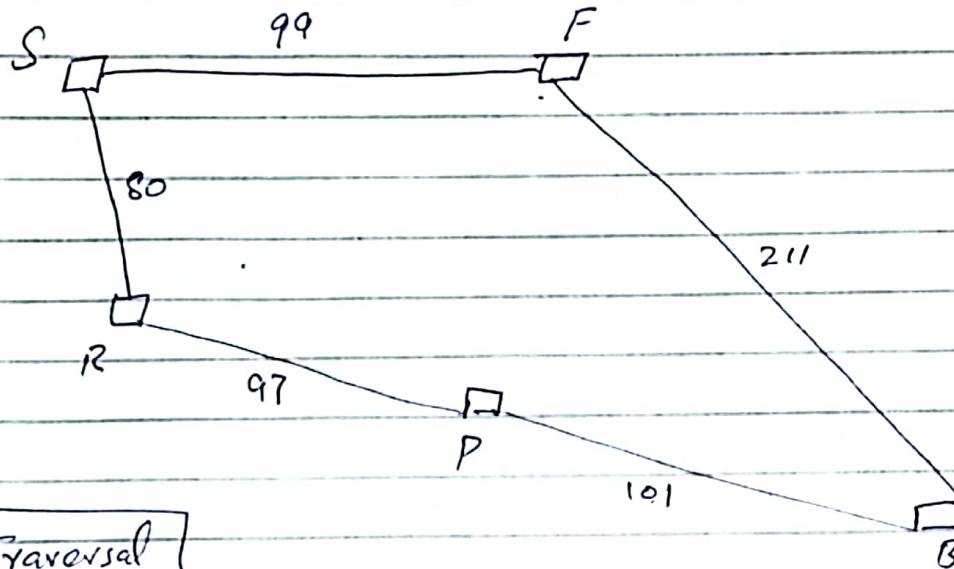
Optimal? Yes if (cost=1)

Time? $O(b^d)$

→ Space? $O(b^d)$

Uniform Cost Search (UCS)

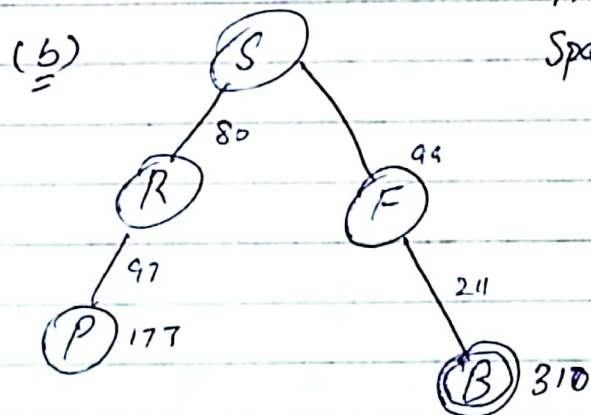
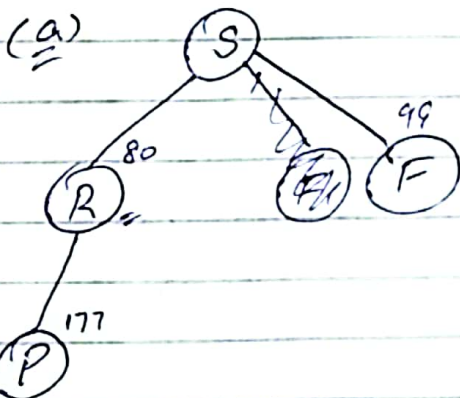
~~Breadth First~~



Start: S
Goal: B

Complete? Yes
Optimal? Yes
Time? no. of Nodes
Space

Tree Traversal



Goal is found but not optimal.

Frontiers ~~Path~~ Representation

(S)

(S, R, 80) (S, F, 99)

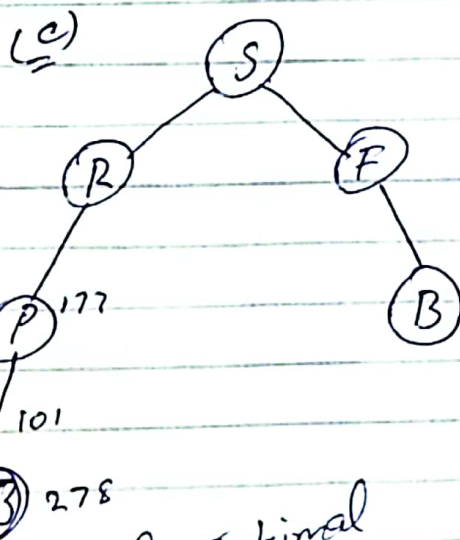
(S, R, P, 177) (S, F, 99) choose min.

(S, R, P, 177) (S, F, B, 310)

(S, R, P, B, 278) (S, F, B, 310)

optimal Goal.

Goal Non optimal



Goal Optimal least cost

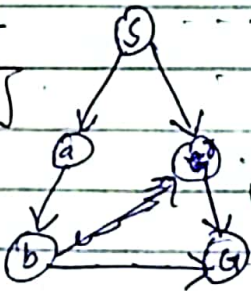
Depth limited Search (DLS)

Frontier : Stack

Same as DFS but depth limited.

$k=2$

$k=3$



Limit 2

if $k=3$
in our example

Complete? No if ($k < d$)

Optimal? No if ($k > d$)

Time? $O(b^k)$

Space? $O(bk)$

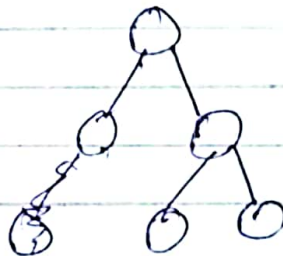
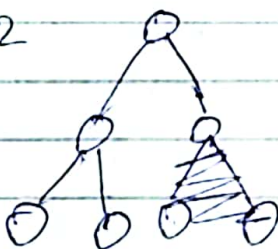
Iterative Deepening Search (IDS)

limit BFS. 2

depth 1



depth 2



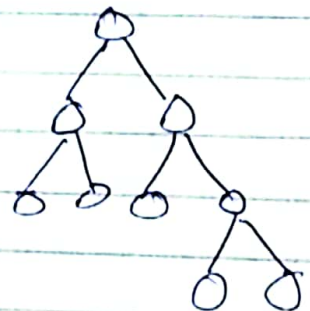
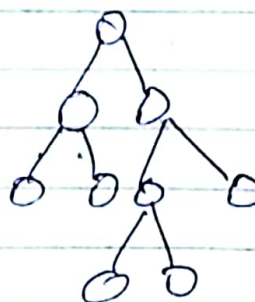
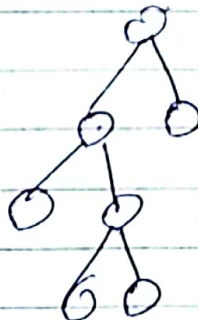
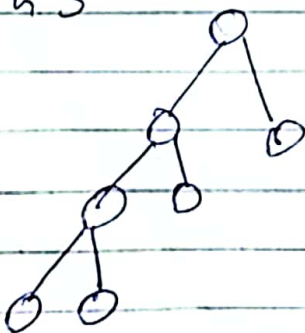
Complete? Yes

Optimal? Yes

Time? $O(b^k)$

Space? $O(bd)$

depth 3

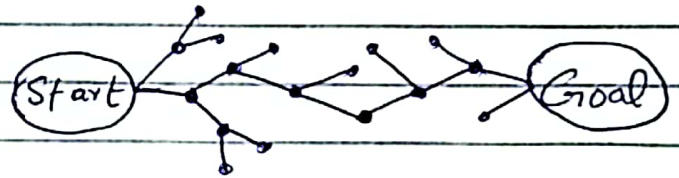


Bidirectional Search

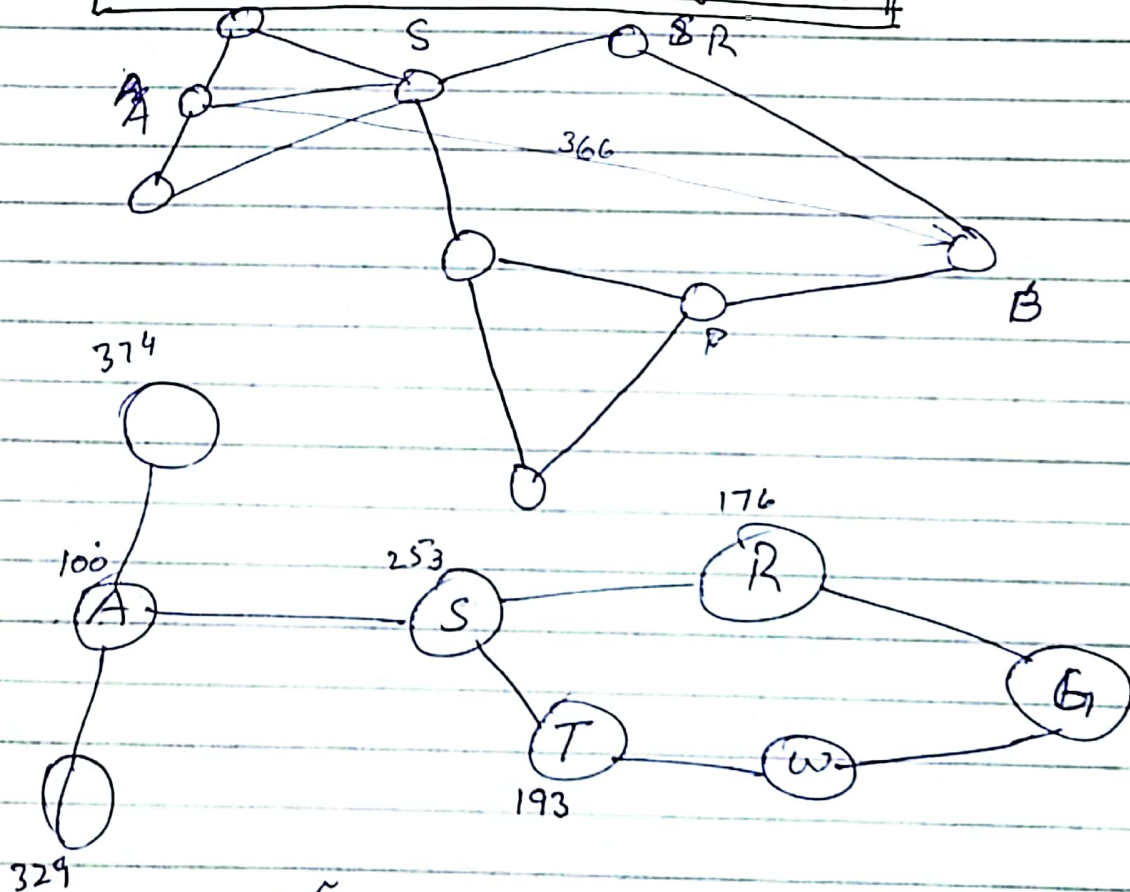
↳ Traverse from both

↳ Start

↳ Goal.



Informed Search Algorithms



Problem