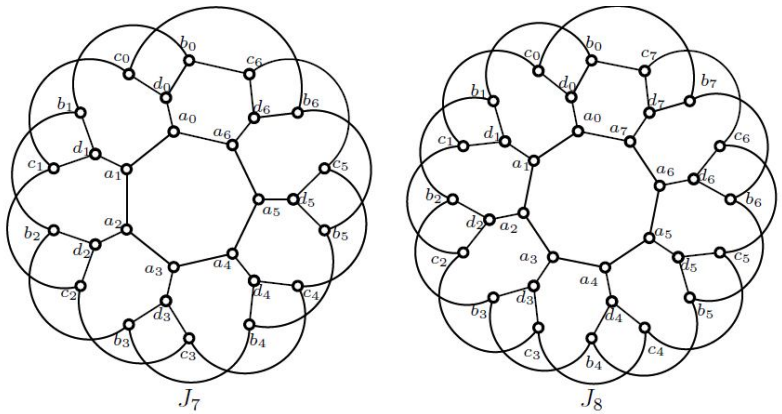
7.3 图的遍历

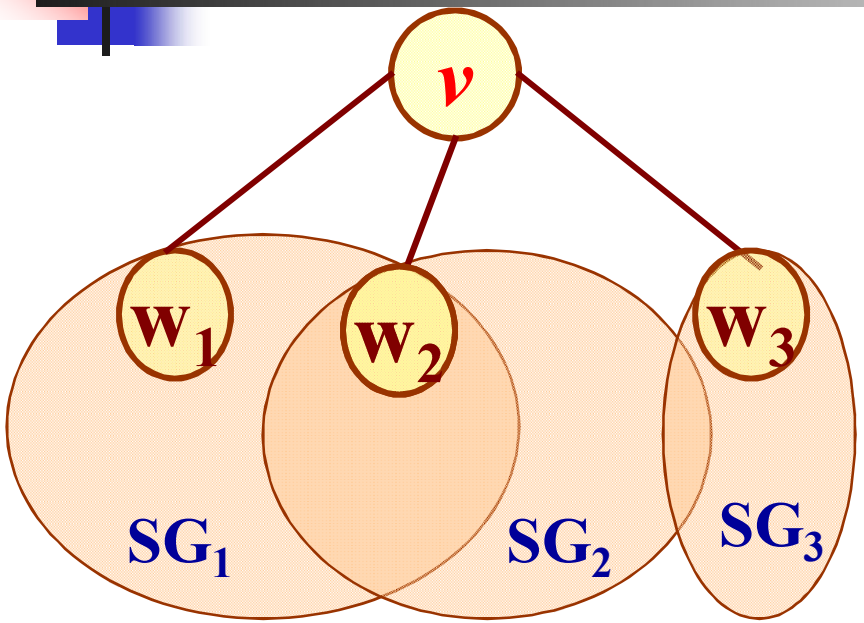
- 从图中某个顶点出发访遍图中其余顶点，并且使图中的每个顶点仅被访问一次的过程。
- 遍历策略：深度优先搜索和广度优先搜索
- 遍历应用举例：图的连通性等



7.3 图的遍历--深度优先搜索

- 从图中某个未被访问的顶点v出发，访问此顶点，然后依次从v的各个未被访问的邻接点出发深度优先搜索遍历图，直至图中所有和v有路径相通的顶点都被访问到。
- 若图中仍存在未被访问的顶点，则从中选择一点做出发点，重复上述过程，直至图中所有的顶点都被访问到。

7.3 图的遍历--深度优先搜索



W_1、W_2和W_3 均为 *v* 的邻接点，
SG_1、SG_2 和 SG_3 分别为含顶点
W_1、W_2和W_3 的子图。

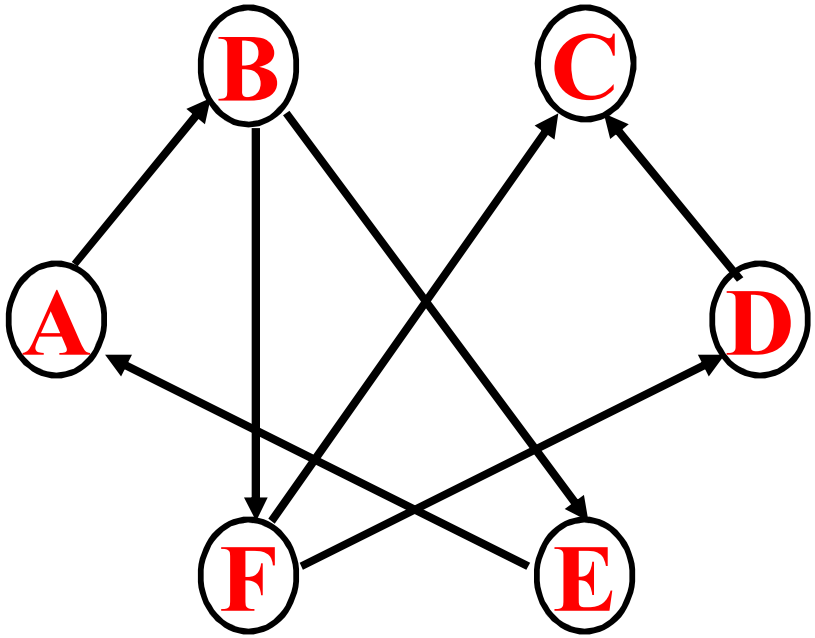
访问顶点 *v*：

for (W_1、W_2、W_3)

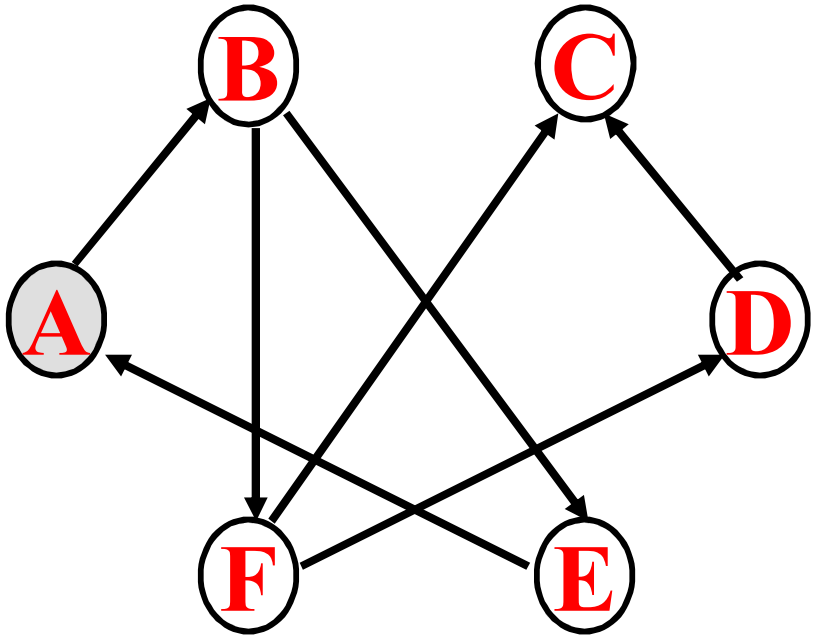
若该邻接点W未被访问，

则从它出发进行深度优先搜索遍历。

深度优先搜索

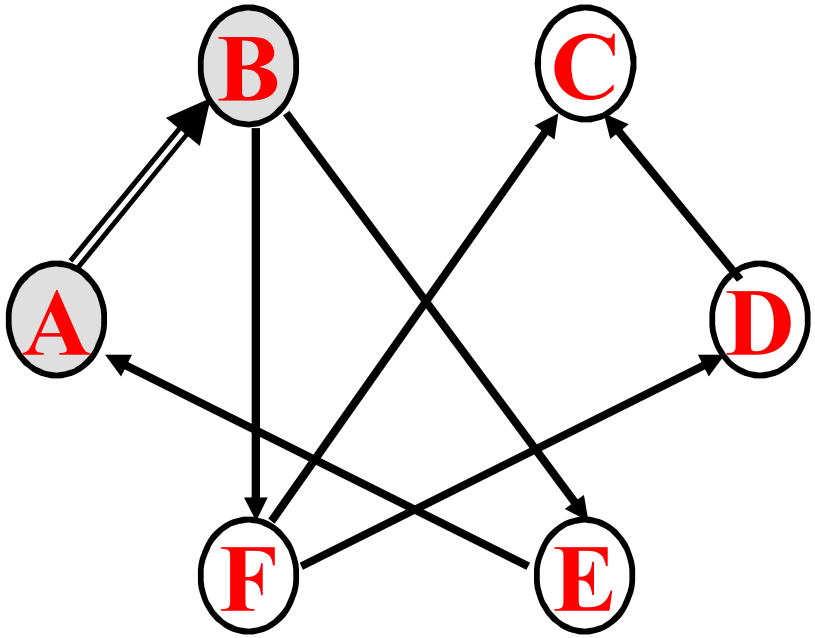


深度优先搜索



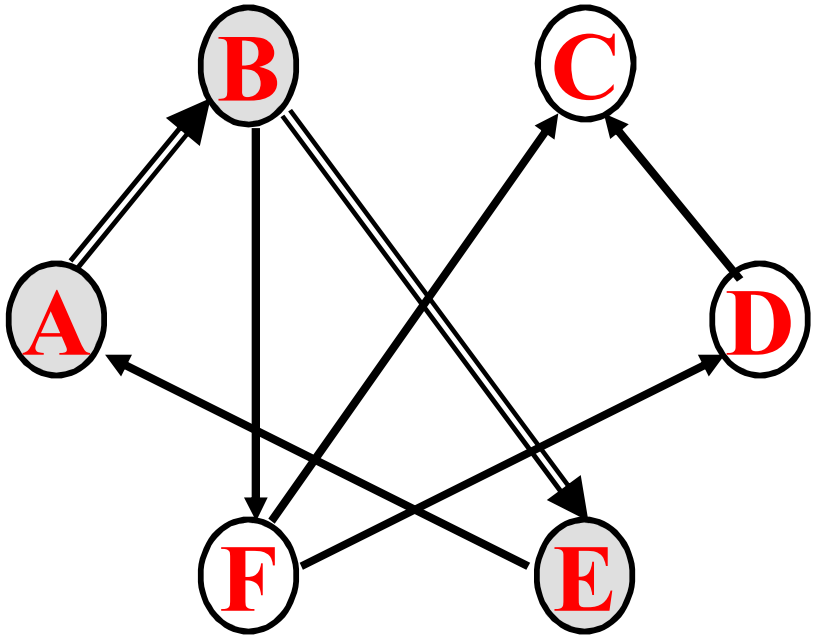
- A

深度优先搜索



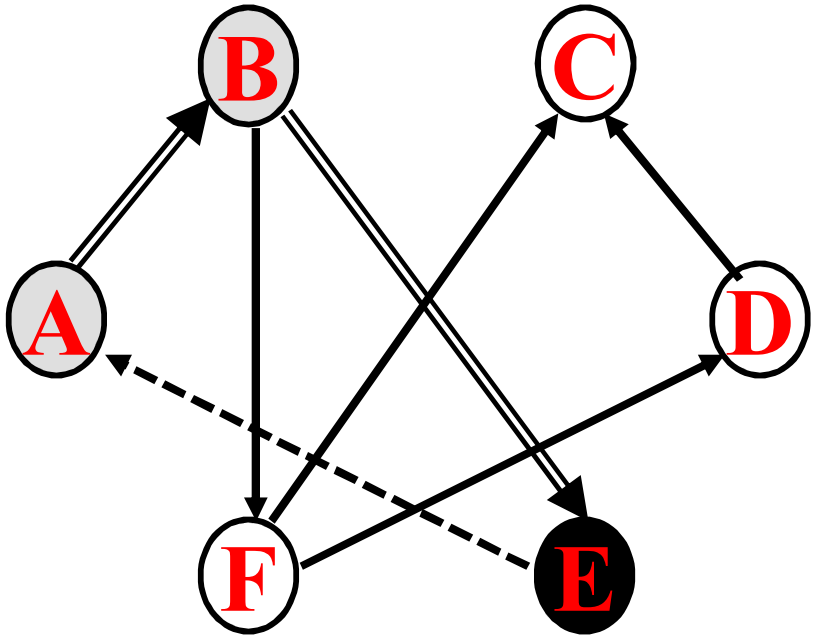
- A,B,

深度优先搜索



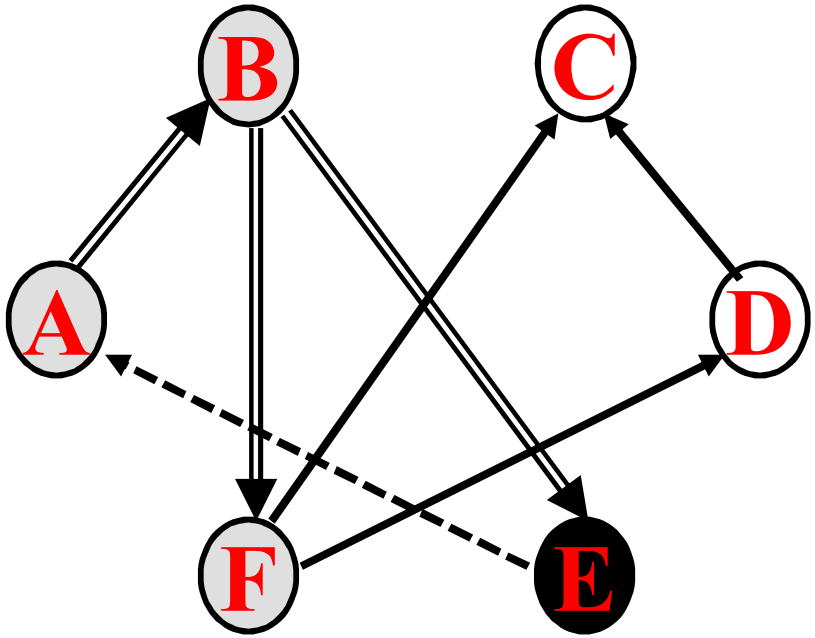
- A,B,E

深度优先搜索



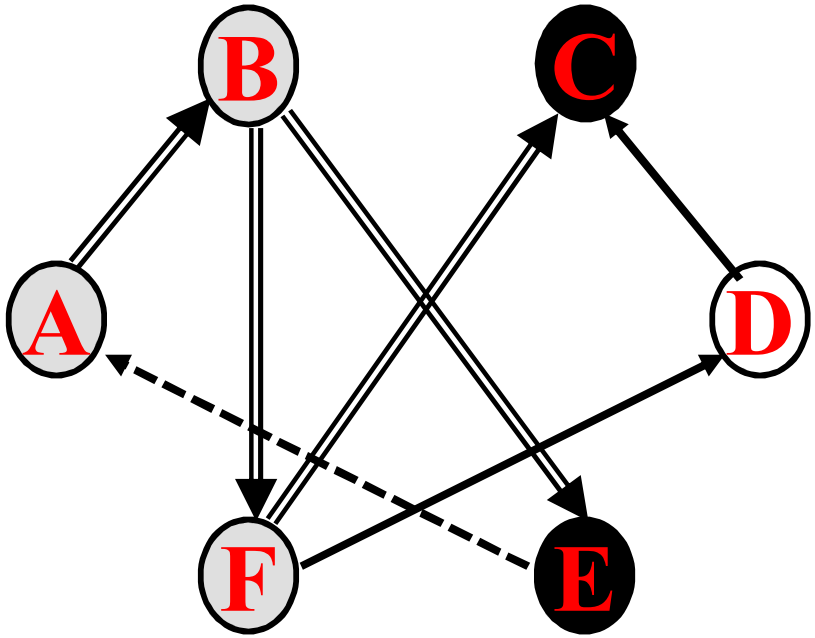
- A,B,E

深度优先搜索



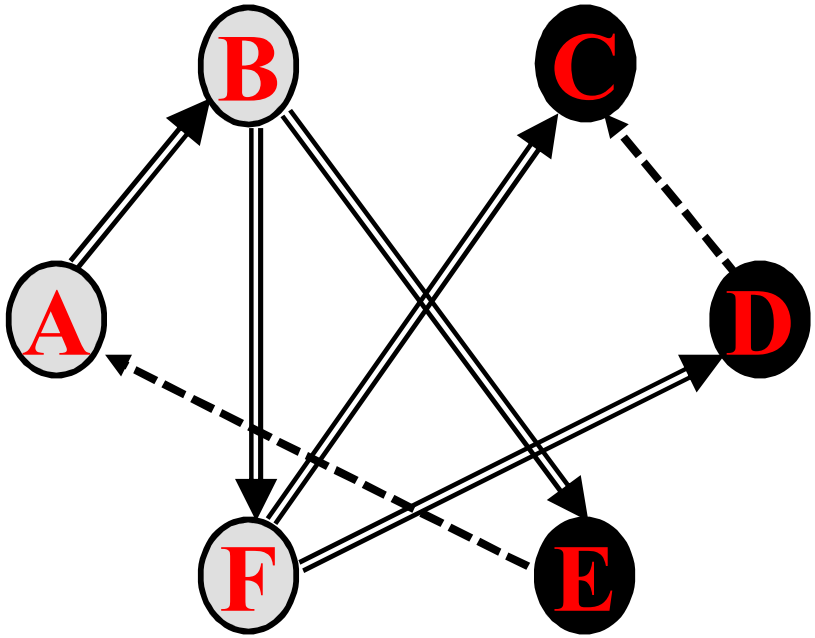
- A,B,E,F

深度优先搜索



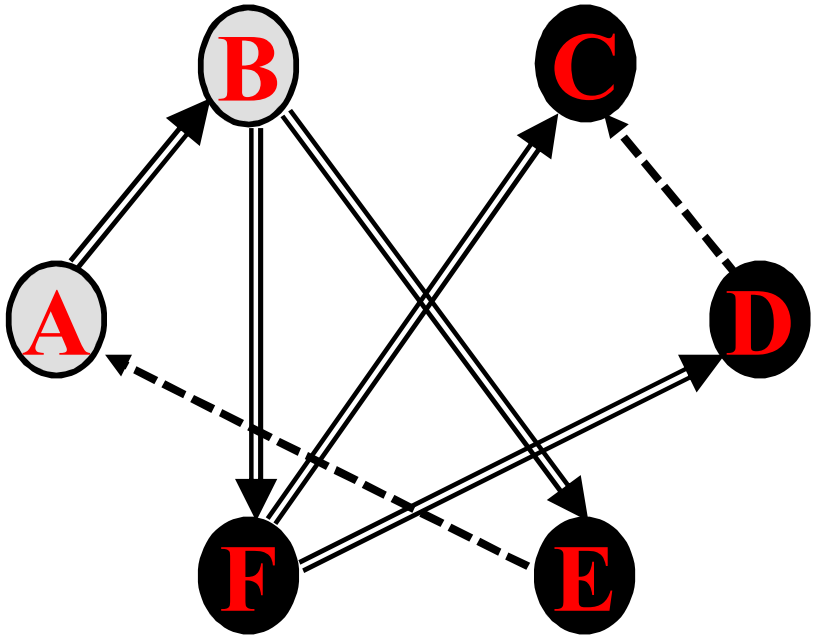
- **A,B,E,F,C**

深度优先搜索



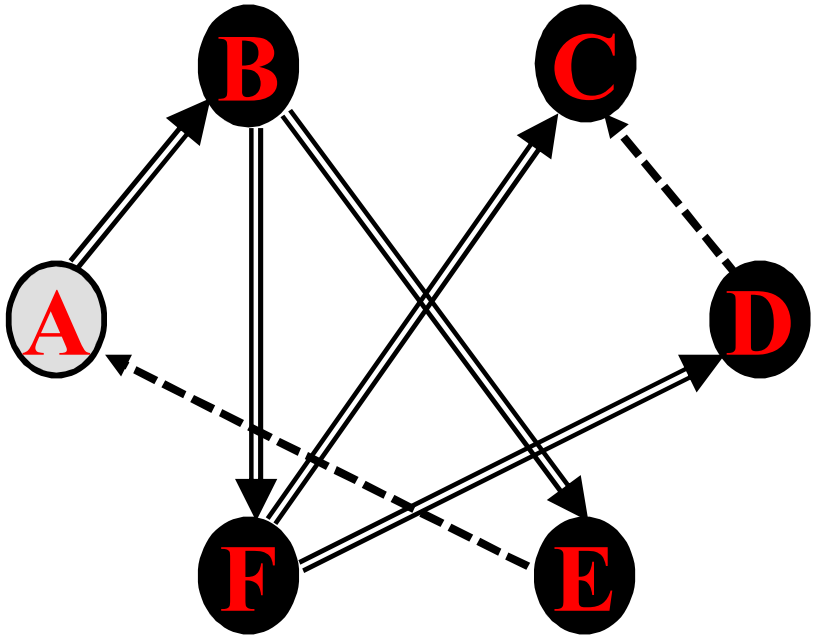
- **A,B,E,F,C,D**

深度优先搜索



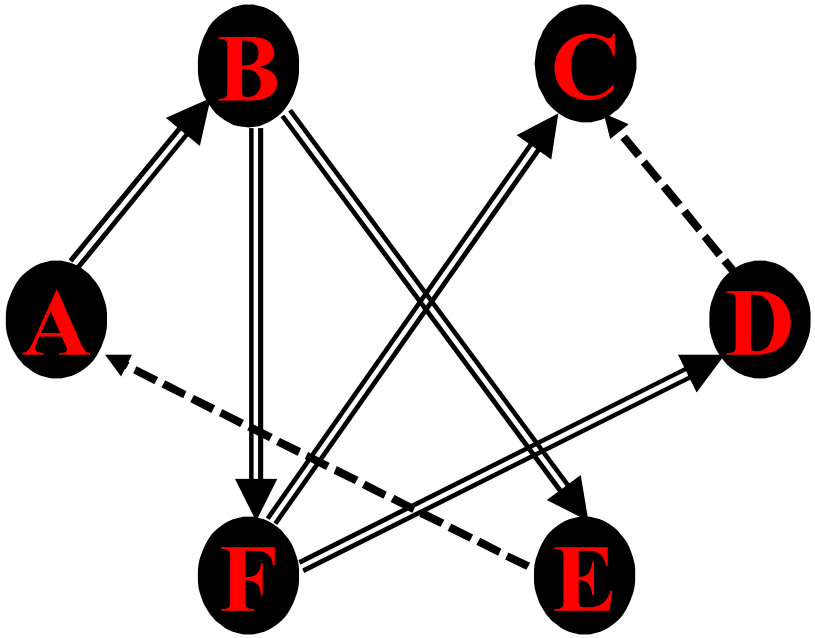
- A,B,E,F,C,D

深度优先搜索



- **A,B,E,F,C,D**

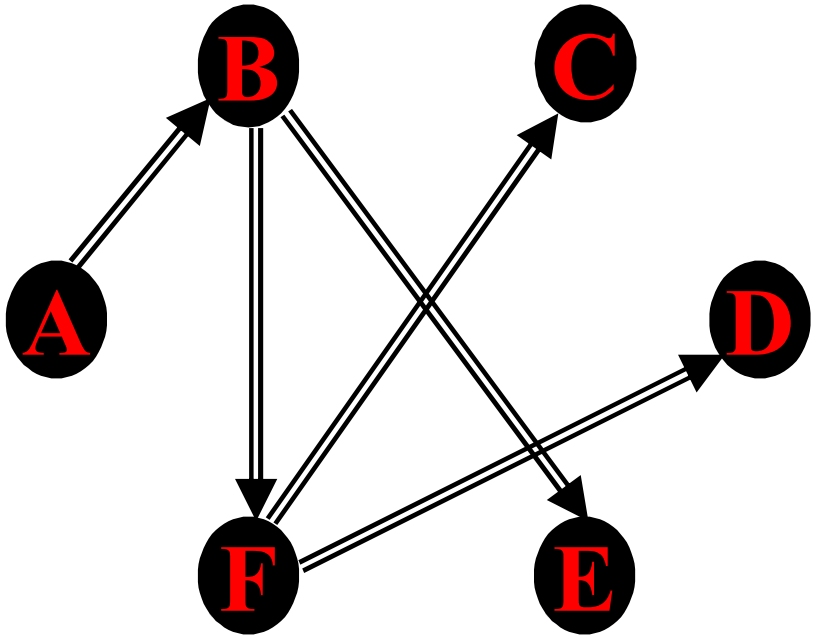
深度优先搜索



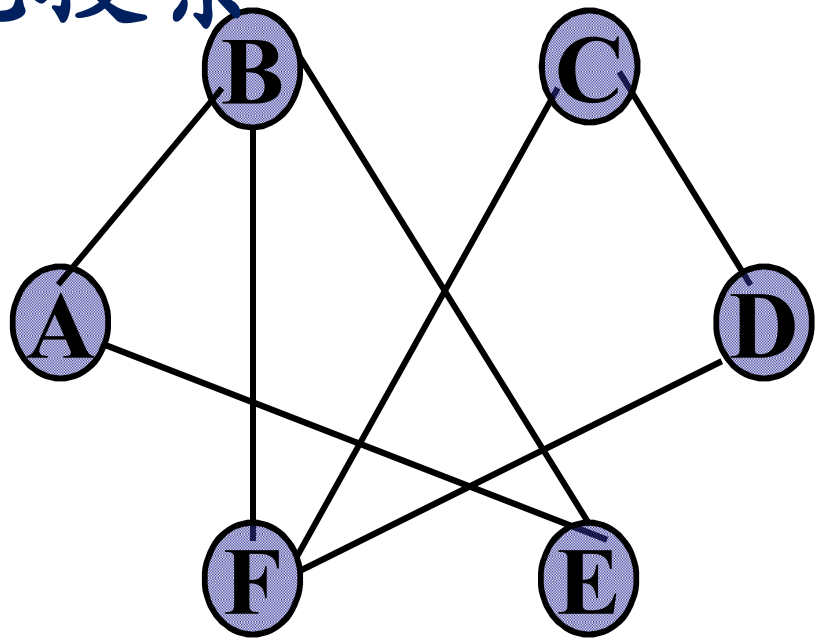
- A,B,E,F,C,D

深度优先搜索

- **深度优先搜索生成树**：访问时经过的顶点和边构成的子图
- **深度优先搜索生成森林**：若选用多个出发点做深度优先搜索，会产生多棵深度优先搜索生成树—构成深度优先搜索生成森林

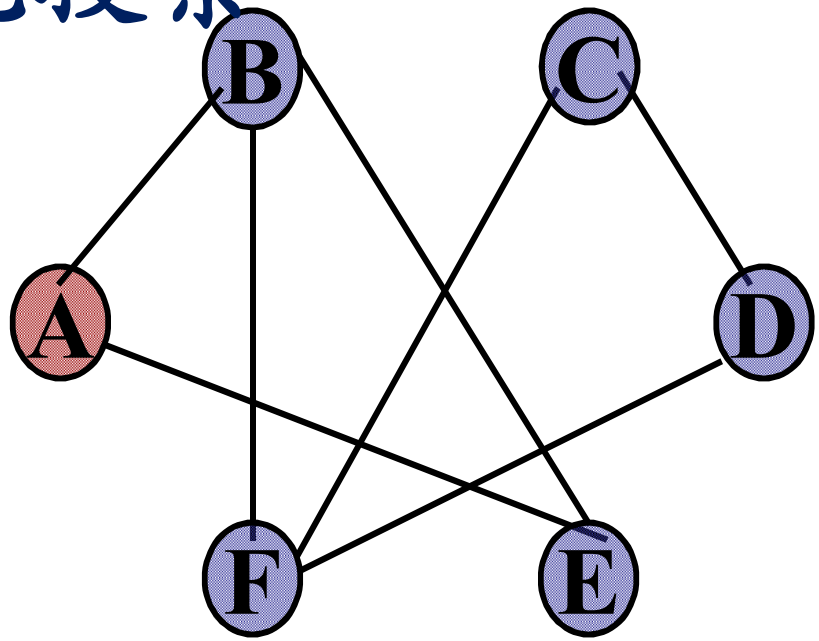


深度优先搜索



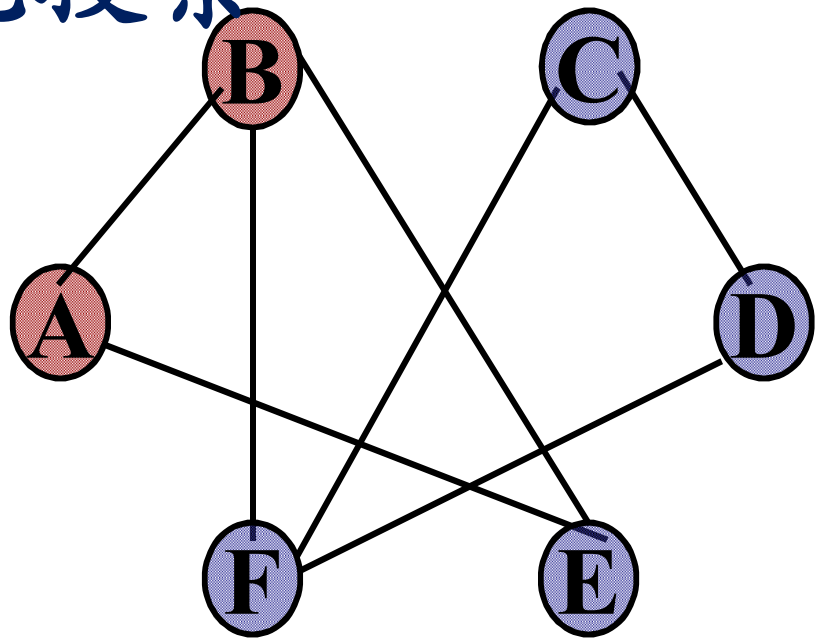
深度优先搜索

A



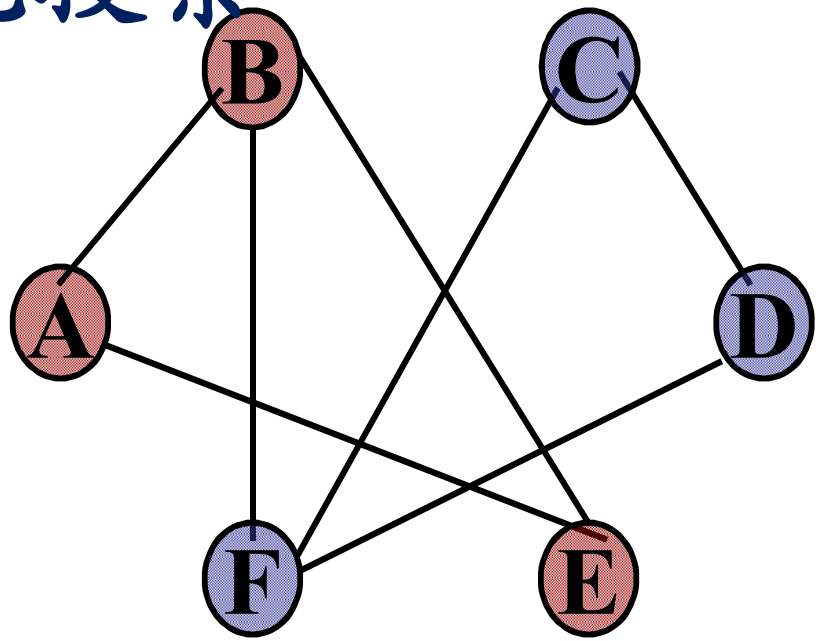
深度优先搜索

AB



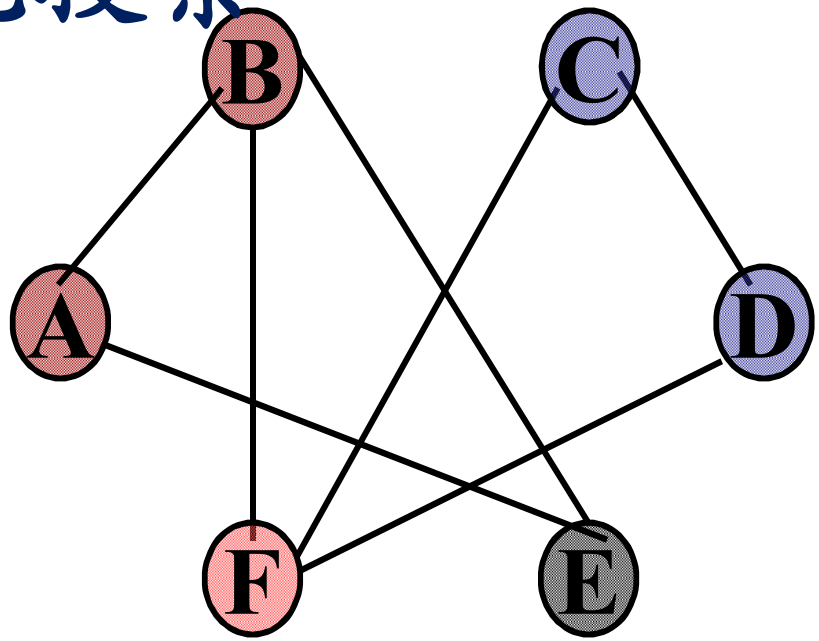
深度优先搜索

ABE



深度优先搜索

ABEF



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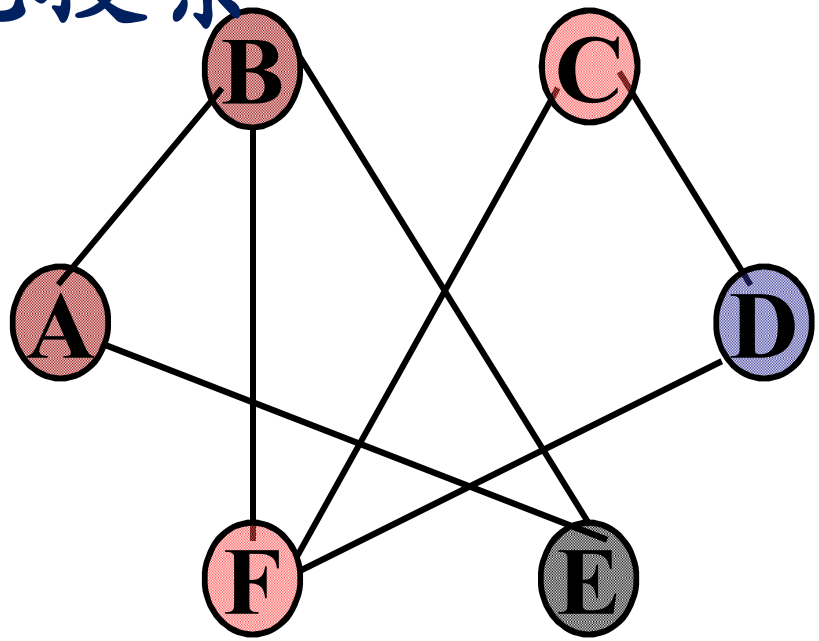
ABEFC



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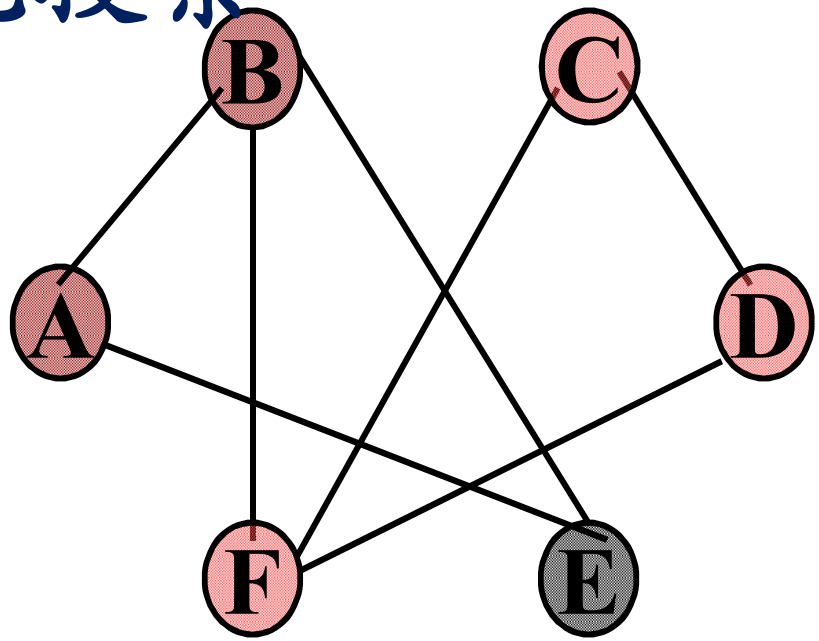
ABEFCD



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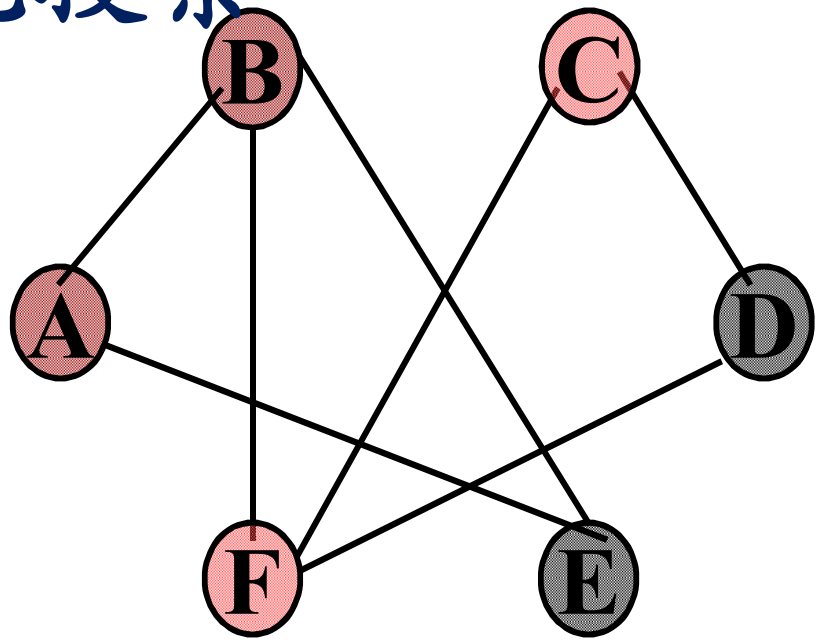

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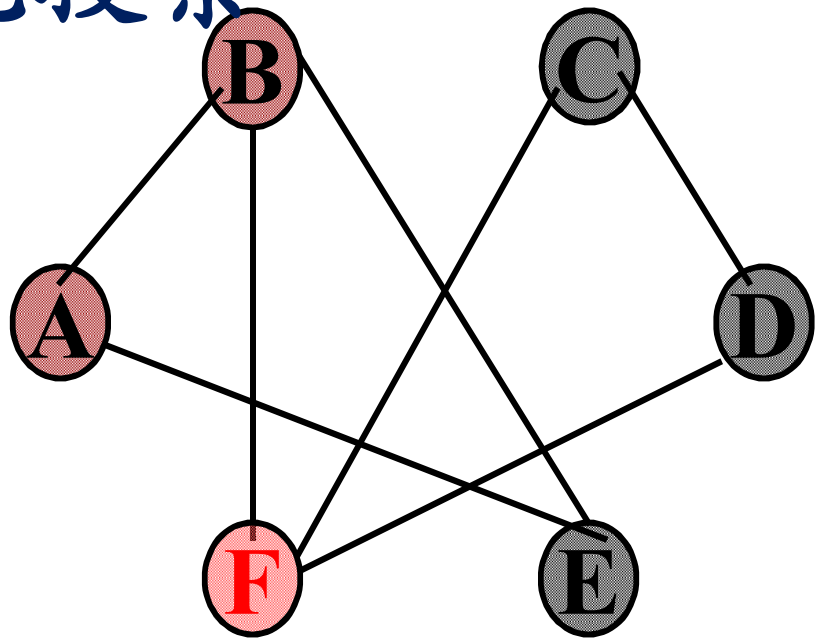

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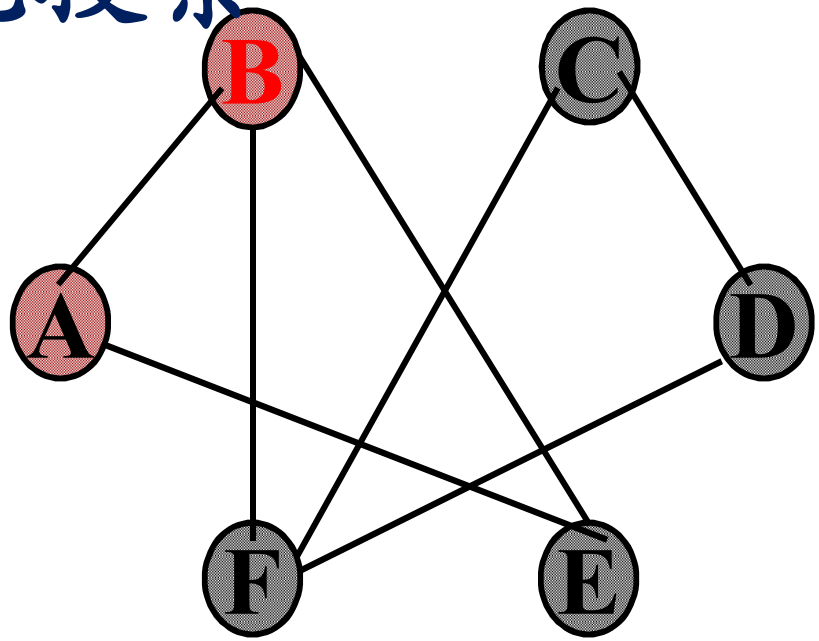

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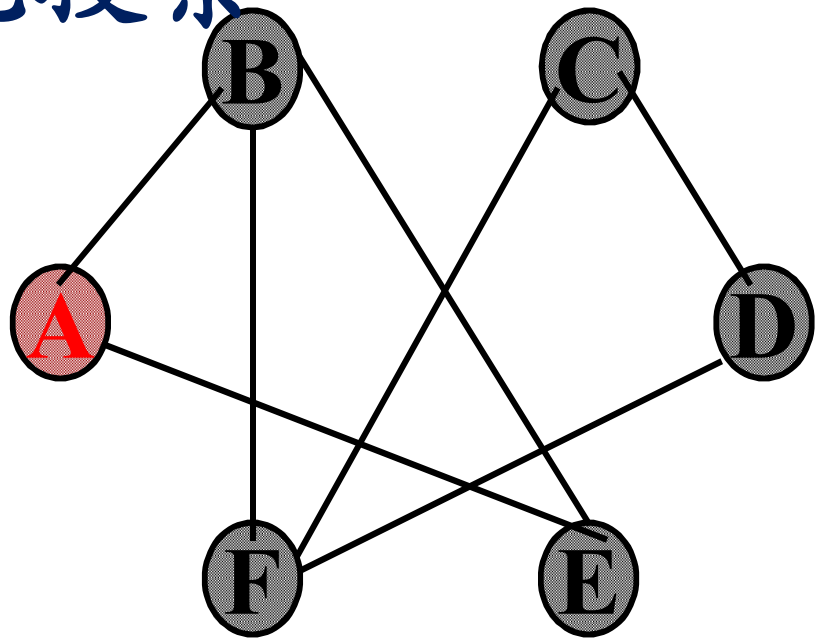

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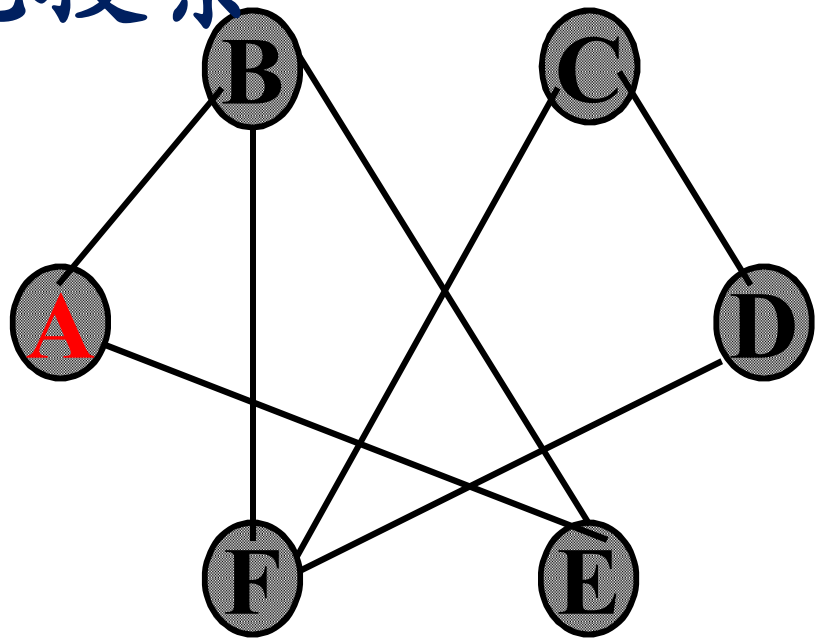
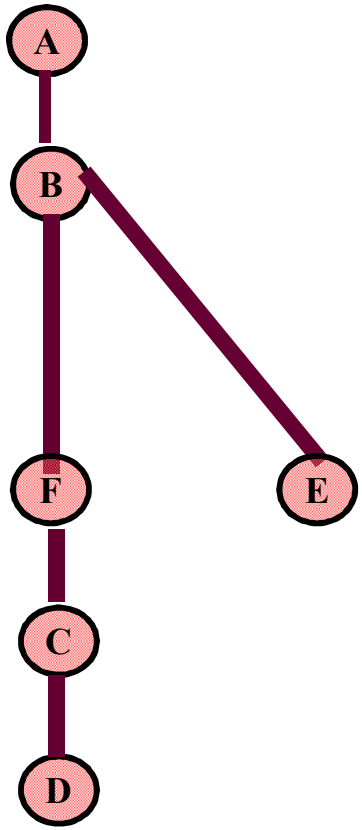
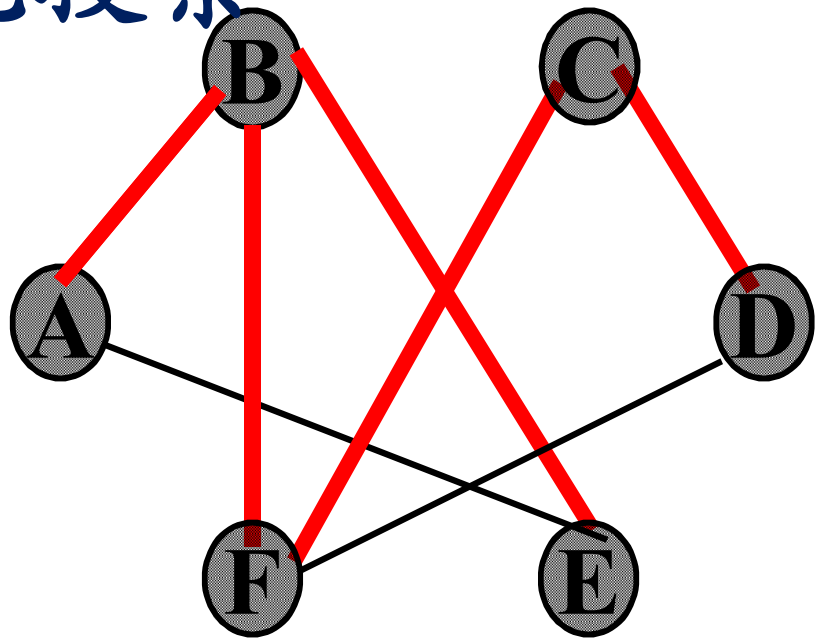


深度优先搜索

ABEFCD

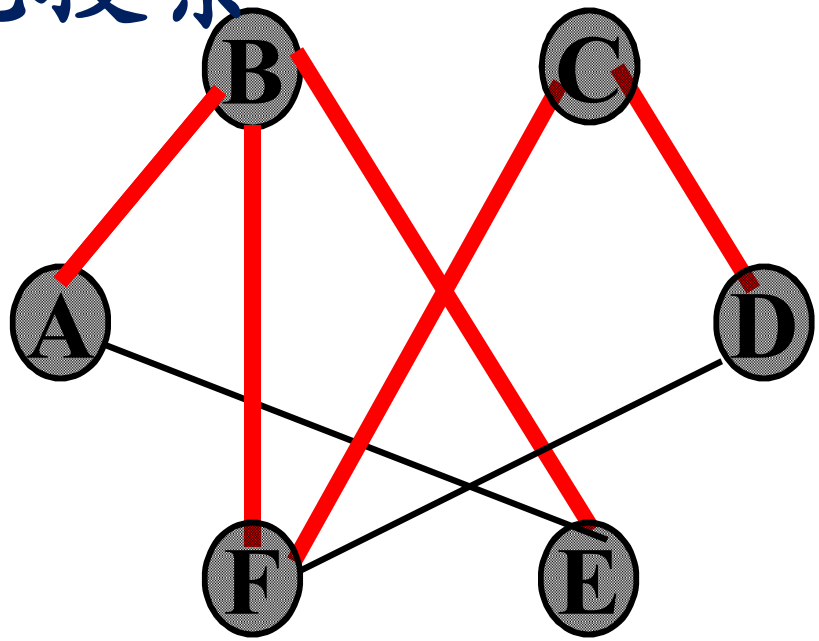


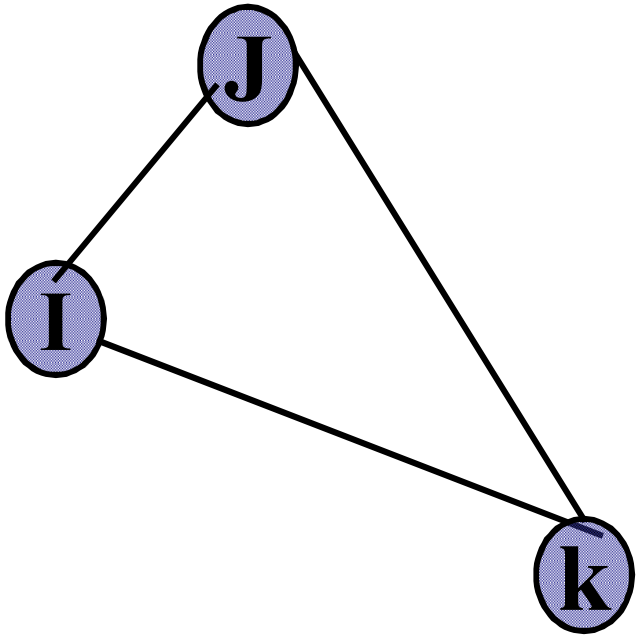


深度优先搜索生成树：访问时经过的顶点和边构成的子图

深度优先搜索

ABEFCD





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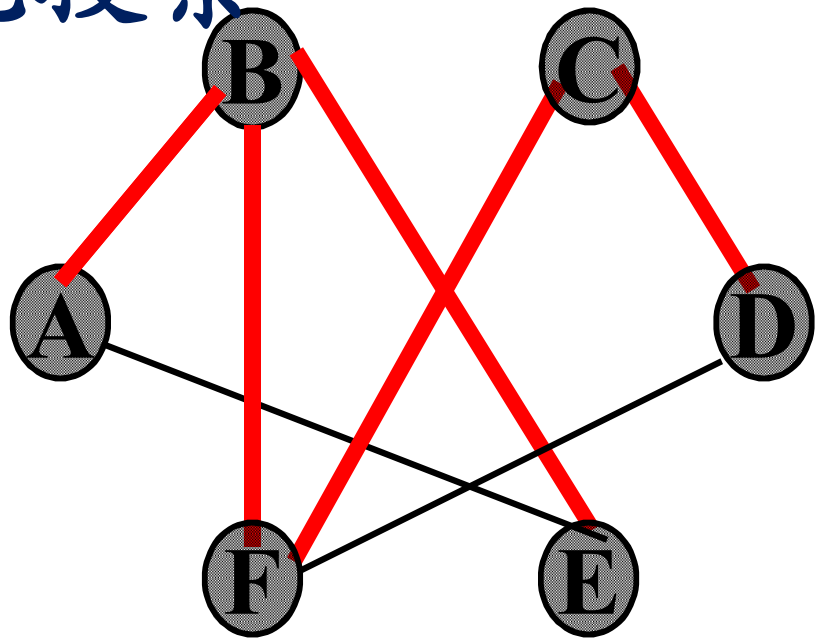

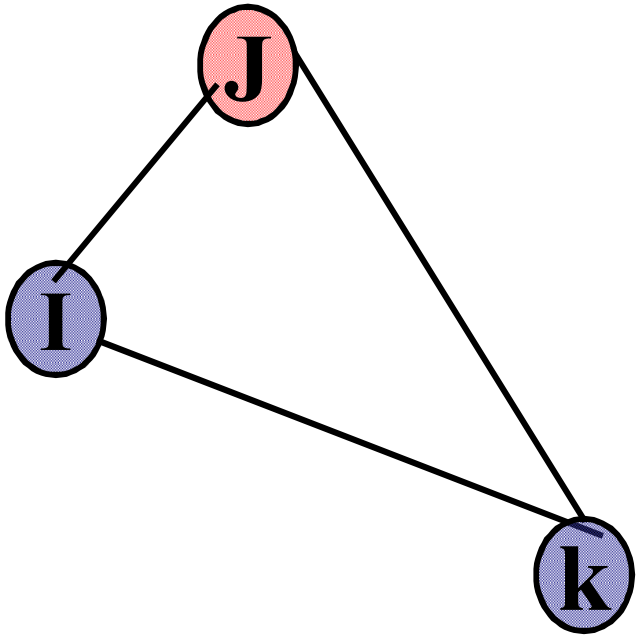

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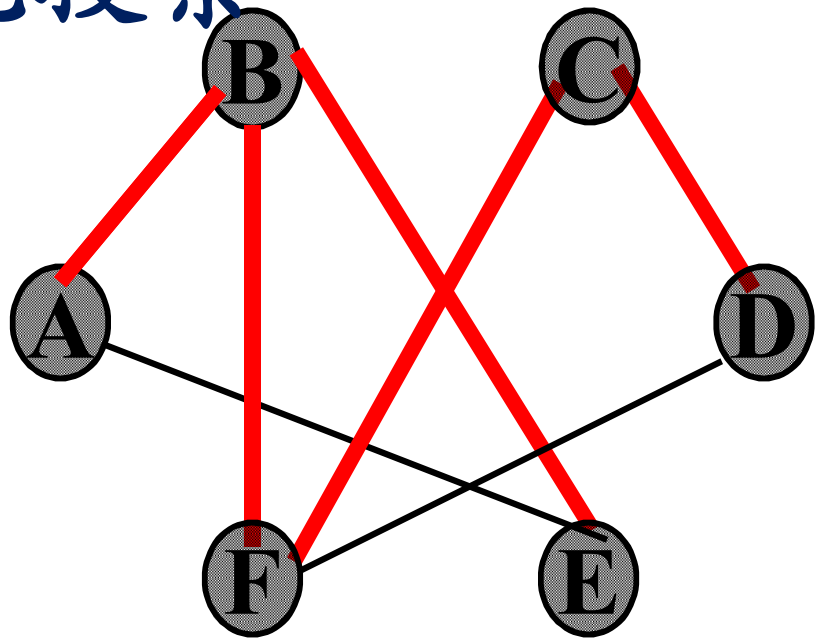

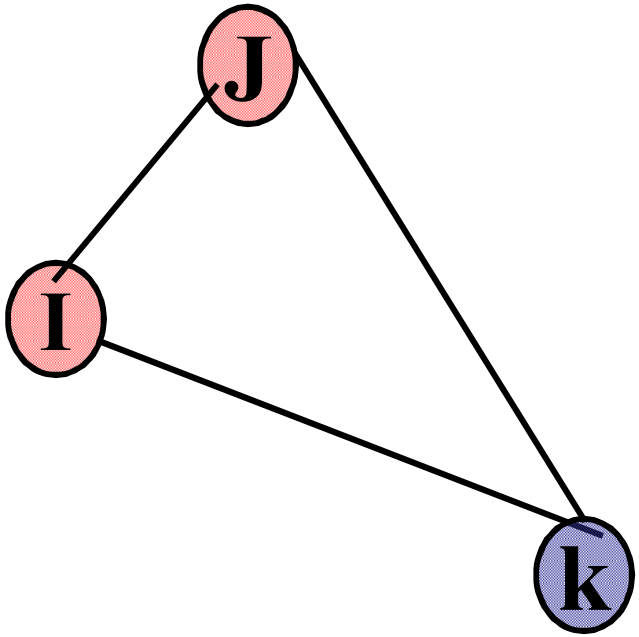

深度优先搜索

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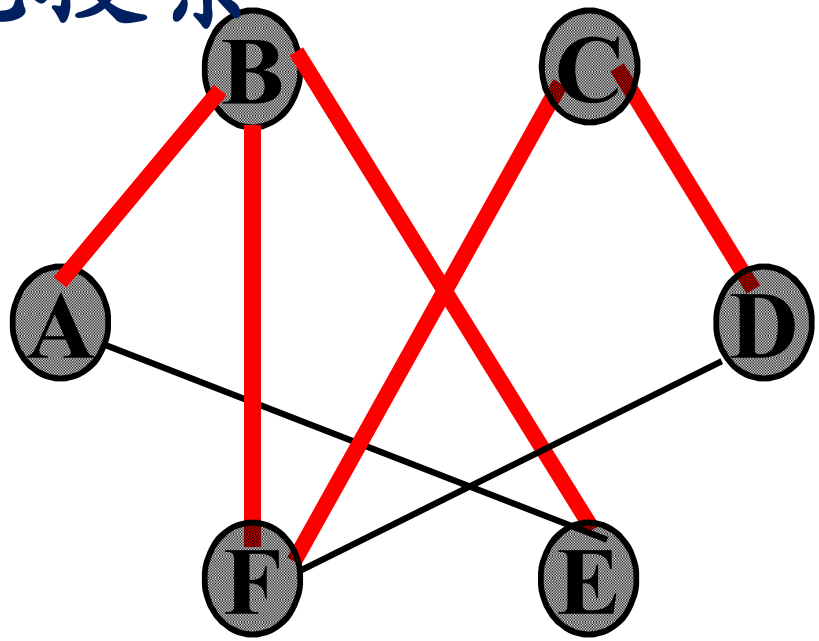

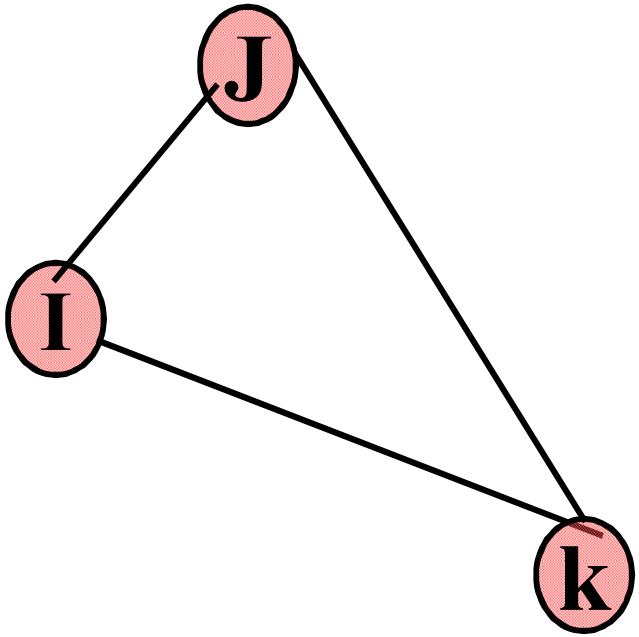

深度优先搜索

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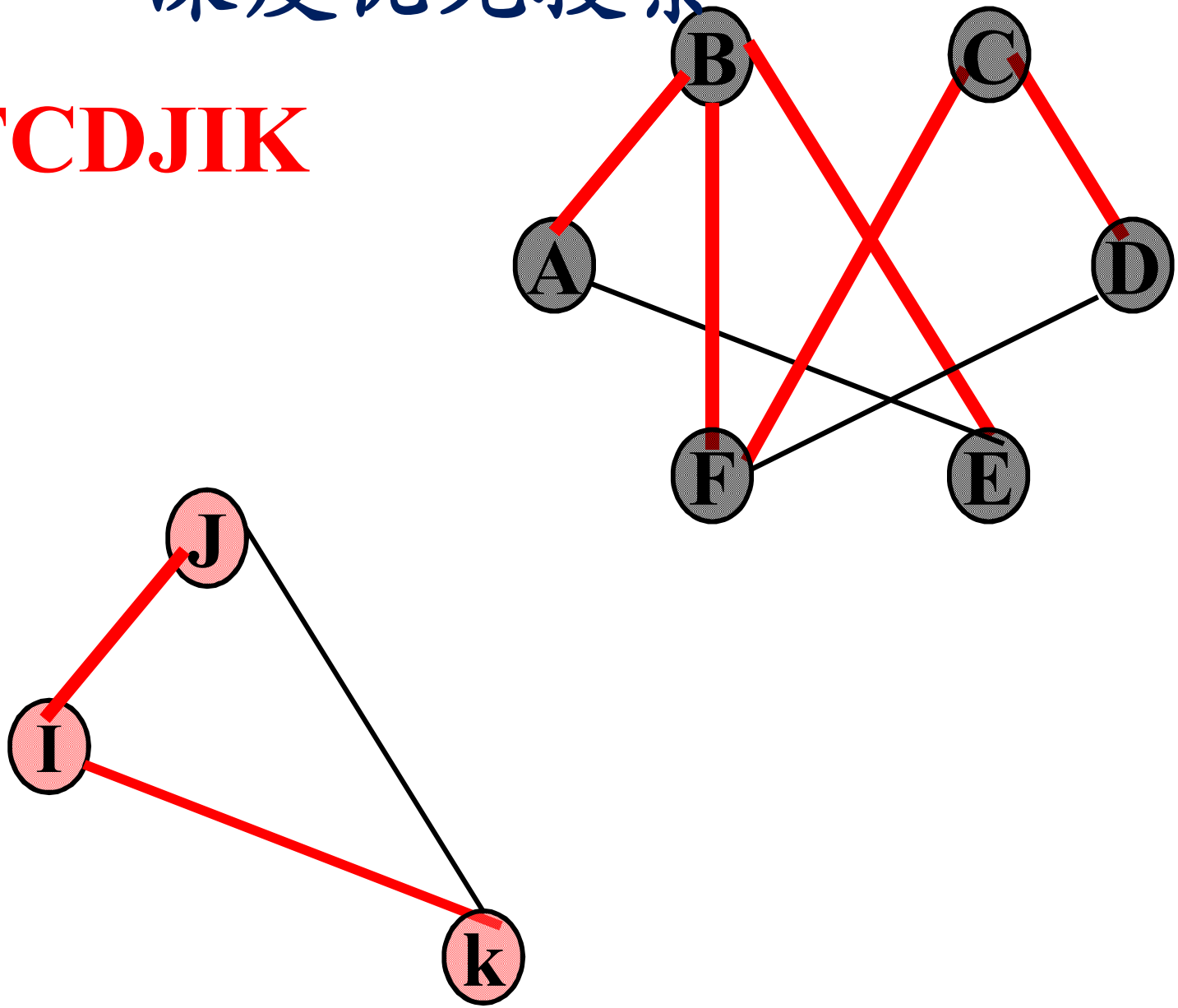
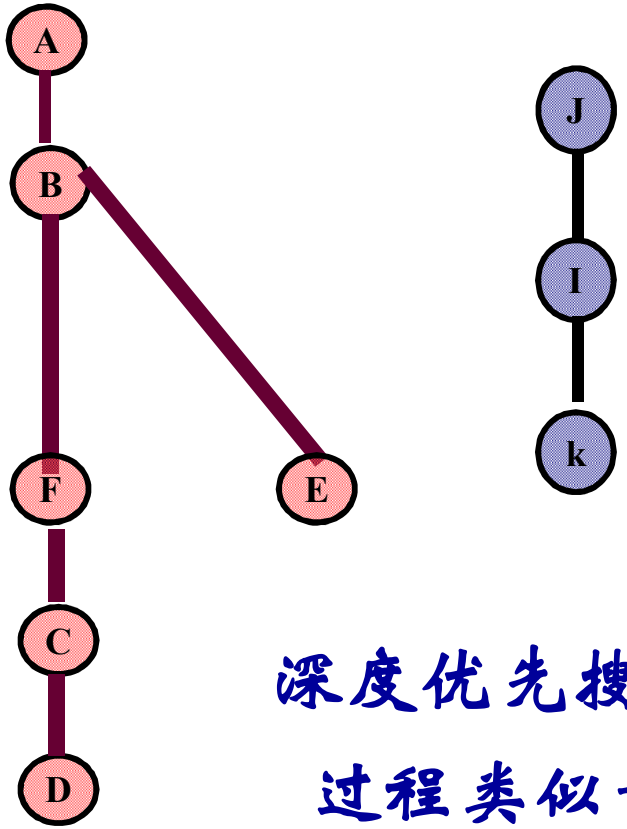


非连通图的深度优先搜索

深度优先搜索生成森林



判断无向图是否连通？

若从无向图中任一点出发能访问到图中所有顶点，则该图为连通图

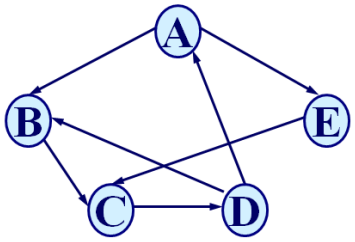
判断有向图是否强连通？

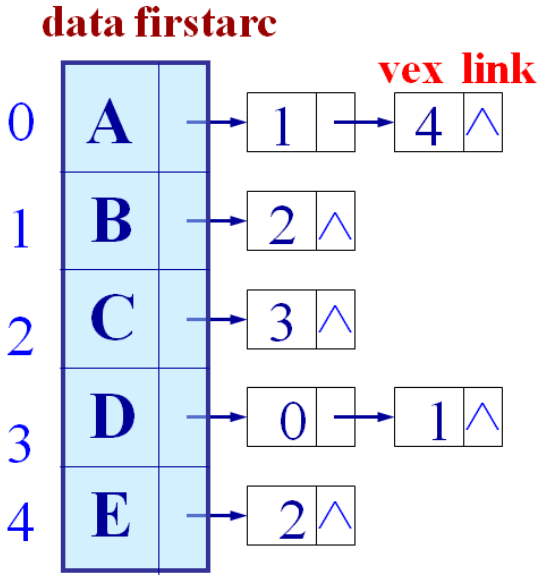
若从有向图中每一点出发能访问到图中所有顶点，则该图为强连通图

深度优先搜索遍历连通图的过程类似于树的先根遍历

7.3 图的遍历--深度优先搜索算法实现

- 图的存储？邻接矩阵和邻接表均可以
- 如何判别v的邻接点是否被访问？
  - 解决的办法：为每个顶点设立一个“访问标志”，设一维数组visited[]，visited[w]=1表示顶点w已经被访问；visited[w]=0表示顶点w尚未被访问。





以邻接表为例实现图的深度优先搜索

```
typedef struct ArcNode {
  int       vex;   // 该弧所指向的顶点的位置
  struct ArcNode  *link;  // 指向下一条弧的指针
  InfoType   *info;   // 该弧相关信息的指针
} ArcNode;
typedef struct VNode {
  VertexType  data;   // 顶点信息
  ArcNode  *firstarc; // 指向第一条依附该顶点的弧
  } VNode;
 typedef struct {
     VNode    arc[MAXSIZE];
     int      vexnum, arcnum;
     int      kind; //图的类型
  } Graphs;
```

7.3 图的遍历--深度优先搜索算法实现

```
void DFS(Graphs G, int v) {
  // 从顶点v出发，深度优先搜索遍历图G
   visited[v] = 1;   printf("%d",v);
   for(p=G.arc[v].firstarc; p!=NULL; p=p->link)
  {    w=p->vex;
       if (!visited[w])  DFS(G, w);
   }
} // DFS
```

7.3 图的遍历--深度优先搜索算法实现

```
void DFSTraverse(Graphs G)
{  // 对图 G 作深度优先遍历
   for (v=0; v<G.vexnum; ++v)
    visited[v] = 0; // 访问标志数组初始化
   for (v=0; v<G.vexnum; ++v)
    if (!visited[v])  DFS(G, v);
          // 对尚未访问的顶点调用DFS
}
```