

Programming 3-11: Flow-1

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1 Problem 3-11-A: 热心市民杰哥

1.1 代码样例

```
1 #define _CRT_SECURE_NO_WARNINGS
2 #include<iostream>
3 #include<cstring>
4 #include<queue>
5 using namespace std;
6 #define N 205
7 #define MAX 100005
8 int n, m, s, t, a, b, c, map[N][N], pre[N];
9 bool vis[N];
10 bool BFS(int s, int t)
11 {
12     int p;
13     queue<int> q;
14     memset(pre, -1, sizeof pre);
15     memset(vis, false, sizeof vis);
16     pre[s] = s, vis[s] = true;
17     q.push(s);
18     while (!q.empty())
19     {
20         p = q.front();
21         q.pop();
22         for (int i = 1; i <= n; ++i)
23             if (map[p][i] && !vis[i])
24             {
25                 pre[i] = p, vis[i] = true;
26                 if (i == t)
27                     return true;
28                 q.push(i);
29             }
30     }
31     return false;
32 }
33 int EK(int s, int t)
34 {
35     int flow = 0, add;
36     while (BFS(s, t))
37     {
38         add = MAX;
```

```
39     for (int i = t; i != s; i = pre[i])
40         if (add > map[pre[i]][i])
41             add = map[pre[i]][i];
42     for (int i = t; i != s; i = pre[i])
43     {
44         map[pre[i]][i] -= add;
45         map[i][pre[i]] += add;
46     }
47     flow += add;
48 }
49 return flow;
50 }
51 int main()
52 {
53     scanf("%d%d%d", &n, &m, &s, &t);
54     memset(map, 0, sizeof map);
55     while (m--)
56     {
57         scanf("%d%d", &a, &b, &c);
58         map[a][b] += c;
59     }
60     printf("%d\n", EK(s, t));
61     return 0;
62 }
63 /*****
64 Problem: 1575
65 User: 171860571
66 Language: C++
67 Result: 正确
68 Time:4 ms
69 Memory:1720 kb
70 *****/
```

Listing 1: A by 171860571

2 Problem 3-11-B: 卫宫家的饭

2.1 代码样例

```
1 #include<iostream>
2 #include<cstdio>
3 #include<cstring>
4 #include<queue>
5
6 using namespace std;
7
8 int N,F,D;
9 int head[2000],depth[2000];
10 const int INF=9999999;
11 int cnt;
12 queue<int>q;
13 int s,t;
14
15 struct Edge{
16     int to;
17     int len;
18     int next;
19 };
20
21 Edge e [100000];
22
23 void adde(int a,int b,int c){
24     e[cnt].to=b;
25     e[cnt].len=c;
26     e[cnt].next=head[a];
27     head[a]=cnt++;
28 }
29
30 int min(int a,int b)
31 {
32     if(a<b) return a;
33     else return b;
34 }
35
36 int bfs()
37 {
38     memset(depth,0,sizeof(depth));
39     depth[s]=1;
40     q.push(s);
41     while(!q.empty()){
42         int k=q.front();
43         q.pop();
44         for(int i=head[k];~i;i=e[i].next){
45             if(e[i].len>0&&depth[e[i].to]==0){
46                 depth[e[i].to]=depth[k]+1;
47                 q.push(e[i].to);
48             }
49         }
50     }
51     if(depth[t]!=0) return 1;
```

```

52     else          return 0;
53 }
54
55 int dfs(int u,int dis)
56 {
57     if(u == t) return dis;
58     for(int i=head[u];~i;i=e[i].next){
59         if(depth[e[i].to]==depth[u]+1&&e[i].len!=0){
60             int di=dfs(e[i].to,min(dis,e[i].len));
61             if(di>0)
62                 {
63                     e[i].len-=di;
64                     e[i^1].len+=di;
65                     return di;
66                 }
67         }
68     }
69     return 0;
70 }
71
72
73 int dinic(){
74     int maxflow=0;
75     while(bfs()){
76         while(int increase=dfs(s,INF)){
77             maxflow+=increase;
78         }
79     }
80     return maxflow;
81 }
82
83
84 int main()
85 {
86     cnt=0;
87     memset(head,-1,sizeof(head));
88     scanf("%d%d%d",&N,&F,&D);
89     for(int i=1;i<=N;i++){
90         adde(i+200,i+400,1);
91         adde(i+400,i+200,0);
92     }
93     for(int i=1;i<=F;i++){
94         adde(0,i,1);
95         adde(i,0,0);
96     }
97     for(int i=1;i<=D;i++){
98         adde(i+600,999,1);
99         adde(999,i+600,0);
100 }
101 int f,d;
102 for(int i=1;i<=N;i++){
103     scanf("%d",&f,&d);
104     int now;
105     for(int j=1;j<=f;j++){
106         scanf("%d",&now);
107         adde(now,i+200,1);
108         adde(i+200,now,0);

```

```
109     }
110     for(int j=1;j<=d;j++){
111         scanf("%d",&now);
112         adde(i+400,now+600,1);
113         adde(now+600,i+400,0);
114     }
115 }
116 s=0;
117 t=999;
118 printf("%d\n",dinic());
119 return 0;
120 }
121 /*****
122 Problem: 1576
123 User: 171240521
124 Language: C++
125 Result: 正确
126 Time:4 ms
127 Memory:2744 kb
128 *****/
```

Listing 2: B by 171240521

3 Problem 3-11-C: 机房的诱惑

3.1 代码样例

```

1  #include <bits/stdc++.h>
2  using namespace std;
3  #define MAXN 500
4  queue<int> Q;
5  int n,m,x,a,b;
6  int g[MAXN][MAXN],pre[MAXN],flow[MAXN],maxflow;
7
8  int bfs(int s, int t){
9      while (!Q.empty()) Q.pop();
10     memset(pre,-1,(n+1)*sizeof(int));
11     pre[s] = 0; flow[s] = INT_MAX;
12     Q.push(s);
13
14     while (!Q.empty()){
15         int cur = Q.front();
16         Q.pop();
17         if (cur==t) return flow[t];
18         for (int i=1;i<=n;++i){
19             if (g[cur][i]>0 && !pre[i]){
20                 pre[i] = cur;
21                 flow[i] = min(flow[cur],g[cur][i]);
22                 Q.push(i);
23             }
24         }
25     }
26     return -1;
27 }
28
29 void EK(int s, int t){
30     int inc;
31     while (~(inc=bfs(s,t))){
32         for (int k=t;k!=s;k=pre[k]){
33             g[pre[k]][k] -= inc;
34             g[k][pre[k]] += inc;
35         }
36         maxflow+=inc;
37     }
38 }
39
40 int main(){
41     scanf("%d%d",&n,&m);
42     for (int i = 1; i <= n; ++i) {
43         scanf("%d%d", &a, &b);
44         g[0][i] += a;
45         g[i][n+1] += b;
46     }
47     for (int i = 1; i <= m; ++i) {
48         scanf("%d%d%d", &a, &b, &x);
49         g[a][b] = x;
50         g[b][a] = x;
51     }

```

```
52 |  
53 |     n++;  
54 |     EK(0,n);  
55 |     printf("%d\n",maxflow);  
56 |     return 0;  
57 | }  
58 | /*****  
59 |     Problem: 1577  
60 |     User: 171860658  
61 |     Language: C++  
62 |     Result: 正确  
63 |     Time:96 ms  
64 |     Memory:2536 kb  
65 | *****/
```

Listing 3: C by 171860658

4 Problem 3-11-D: 圣诞礼物

4.1 代码样例

```
1 #include <stdio.h>
2 #include <algorithm>
3 using namespace std;
4 #define ll long long
5 #define N 1000009
6 int n,t,a[N],b[N];
7 ll suma,sumb,ans;
8
9 int main(){
10     scanf("%d",&t);
11     while(t--){
12         suma=sumb=ans=0;
13         scanf("%d",&n);
14         for(int i=1;i<=n;i++){
15             scanf("%d%d",&a[i],&b[i]);
16             suma+=a[i];
17             sumb+=b[i];
18         }
19         ans=min(suma,sumb);
20         for(int i=1;i<=n;i++){
21             ans=min(ans,suma+sumb-a[i]-b[i]);
22         }
23         printf("%lld\n",ans);
24     }
25 }
26 /*****
27 Problem: 1578
28 User: 171860538
29 Language: C++
30 Result: 正确
31 Time:692 ms
32 Memory:8768 kb
33 *****/
```

Listing 4: D by 171860538