Symmetric Matrix Generator

```
% Rows of stiffness matrix, starting from the diagonal
r1=[7.5,0,-7.5,0,0,0,0,0];
r2=[7.5,0,0,0,-7.5,0,0];
r3=[10.152,-2.652,-2.652,2.652,0,0];
r4=[2.652,2.652,-2.652,0,0];
r5=[6.629,1.325,3.977,3.977];
r6=[14.129,3.977,3.977];
r7=[3.977,3.977];
r8=[3.977];

n_r=length(r1); % Number of rows
K=zeros(n_r,n_r); % Blank stiffness matrix

% Symmetric Matrix Assembly
for i=1:n_r
    d=join(['r',num2str(i)]);
    rowvalues=eval(d);
    K(i,i:end)=rowvalues;
    K(i:end,i)=rowvalues;
end
K
```

```
K = 8×8
    7.5000         0   -7.5000         0         0         0         0         0
         0    7.5000         0         0         0   -7.5000         0         0
   -7.5000         0   10.1520   -2.6520   -2.6520    2.6520         0         0
         0         0   -2.6520    2.6520    2.6520   -2.6520         0         0
         0         0   -2.6520    2.6520    6.6290    1.3250    3.9770    3.9770
         0   -7.5000    2.6520   -2.6520    1.3250   14.1290    3.9770    3.9770
         0         0         0         0    3.9770    3.9770    3.9770    3.9770
         0         0         0         0    3.9770    3.9770    3.9770    3.9770
```

Stiffness Matrix Partitioner

```
DRP=[3,5,6]; % Index of essential degrees of freedom
n_DRP=length(DRP) % Number of essential degrees of freedom
```

```
n_DRP = 3
```

```


for i=1:n_DRP % Function to swap rows between the essential DOF columns and the rows at the top
    K([DRP(i),end-(i-1)],:)=K([end-(i-1),DRP(i)],:);
end

for i=1:n_DRP % Function to swap columns between the essential DOF columns and the columns at t
    K(:,[DRP(i),end-(i-1)])=K(:,[end-(i-1),DRP(i)]);
end
K_partitioned=K % Partitioned Matrix
```

```
K_partitioned = 8×8
    7.5000         0         0         0         0         0         0   -7.5000
         0    7.5000         0         0         0   -7.5000         0         0
```

```
         0         0    3.9770         0    3.9770    3.9770    3.9770         0
         0         0         0    2.6520         0   -2.6520    2.6520   -2.6520
         0         0    3.9770         0    3.9770    3.9770    3.9770         0
         0   -7.5000    3.9770   -2.6520    3.9770   14.1290    1.3250    2.6520
         0         0    3.9770    2.6520    3.9770    1.3250    6.6290   -2.6520
   -7.5000         0         0   -2.6520         0    2.6520   -2.6520   10.1520
```

Solving for unknown df

```
f_f=[-10;-30;0];
K_FF=K_partitioned(6:end,6:end)
```

```
K_FF = 3×3
   14.1290    1.3250    2.6520
    1.3250    6.6290   -2.6520
    2.6520   -2.6520   10.1520
```

```
K_FF_inv=inv(K_FF)
```

```
K_FF_inv = 3×3
    0.0784   -0.0267   -0.0275
   -0.0267    0.1775    0.0533
   -0.0275    0.0533    0.1196
```

```
df=K_FF_inv*f_f
```

```
df = 3×1
    0.0155
   -5.0590
   -1.3256
```