Assignemnt 1 (Optimization method)

Question 4

In [35]:

```
from gurobipy import *#--------------importing required libraries
import numpy as np
import networkx as nx
import random
import matplotlib.pyplot as plt
from string import*
from pandas import *
from random import randrange
```

In [ ]:

```

```

In [ ]:

```

```

In [36]:

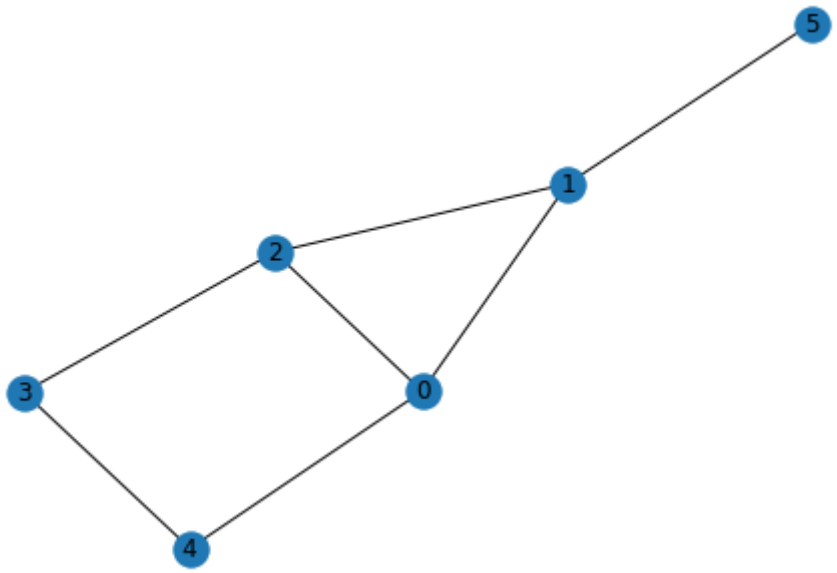
```
X= int(input("Enter Number of Vetex:"))#------------------inputing the total number of vert
print("you hhave entered vertex: " ,+ X)
```

```
Enter Number of Vetex:6
you hhave entered vertex:  6
```

The question states that, each vertex should have less then or equal X/2 edges connected to it.

In [57]:

```
#----------------------creating
a =[]
graph_C = []#----------------this list will contain all the edges

b= []
for i in range(X):




    rand_num_edge = randrange(int(X/2))+1#--------------using this values can range from 0

    for j in range(rand_num_edge):

        c = 0
        count = 0
        a.clear()
        b.clear()

        k = randrange(X-1)

        a.append(i)
        b.append(k)
        c = a+b




        for el in range(len(graph_C)):#-----------------------loop to check to avoid repea
            if(graph_C[el] == [i,k] or graph_C[el] == [k,i]):

                count = count +1
                #print("counted")




        if (count >=1):#---------------repeating loop repeated edges moore than x/2
            j = j-1

            #print("repeated")
            continue

        graph_C.append(c)




graph_C
graph = nx.Graph()
graph.add_edges_from(graph_C)
nx.draw(graph, with_labels=True)
plt.show()
```



In [49]:

```
graph_C
```

Out[49]:

```
[[0, 4], [1, 1], [1, 2], [1, 0], [3, 2], [4, 3], [5, 4]]
```

gurobi starts here (optimization starts from here)

In [58]:

```
vertices  = range(X)
edges     = graph_C


m = Model()
vertexVariable = {}

for v in vertices:
    vertexVariable[v] = m.addVar(vtype=GRB.BINARY,obj=1)

m.update()

for edge in edges:
    u = edge[0]
    v = edge[1]
    xu = vertexVariable[u]
    xv = vertexVariable[v]
    m.addConstr(xu + xv >= 1, name="e%d-%d" % (u, v))

m.update()

m.optimize()

cover = []

for v in vertices:
    if vertexVariable[v].X > 0.5:
        print ('Vertex--------------------------SEE HERE----------------------', + v)
        cover.append(v)

for edge in edges:
    u = edge[0]
    v = edge[1]
```

```
Gurobi Optimizer version 9.0.2 build v9.0.2rc0 (win64)
Optimize a model with 9 rows, 6 columns and 16 nonzeros
Model fingerprint: 0xa52a2275
Variable types: 0 continuous, 6 integer (6 binary)
Coefficient statistics:
  Matrix range     [1e+00, 2e+00]
  Objective range  [1e+00, 1e+00]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 1e+00]
Found heuristic solution: objective 3.0000000
Presolve removed 9 rows and 6 columns
Presolve time: 0.00s
Presolve: All rows and columns removed

Explored 0 nodes (0 simplex iterations) in 0.01 seconds
Thread count was 1 (of 8 available processors)

Solution count 1: 3

Optimal solution found (tolerance 1.00e-04)
```

```
Best objective 3.000000000000e+00, best bound 3.000000000000e+00, gap 0.00
00%
Vertex-------------------------SEE HERE---------------------- 1
Vertex-------------------------SEE HERE---------------------- 2
Vertex-------------------------SEE HERE---------------------- 4
```

In [ ]:

In [ ]:

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