**NPTEL**

**NPTEL ONLINE CERTIFICATION COURSE**

**Discrete Mathematics**
**Graph Theory – 3 &**
**Generating Functions**

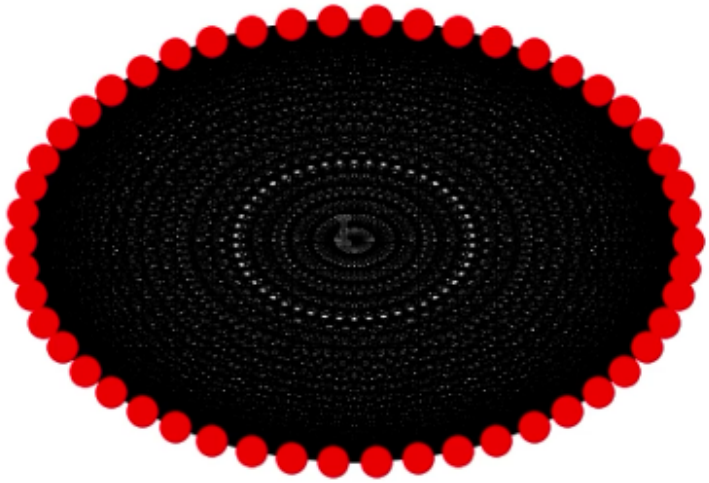
**NetworkX - Isomorphic graphs Part 2**
**By**
**Prof. S.R.S Iyengar**
**Department of Computer Science**
**IIT Ropar**

So we'll be continuing to see if 2 graphs are isomorphic, so first I'm going to import NetworkX as NX, and I'm going to create the graph G as a complete graph now complete graph on let's say 50 nodes, and I'm going to create another graph H again on 50 nodes itself let's say a complete graph on 50 nodes
(Refer Slide Time: 01:22)

```
IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete_graph(50)

In [3]: H=nx.complete_graph(50)
```

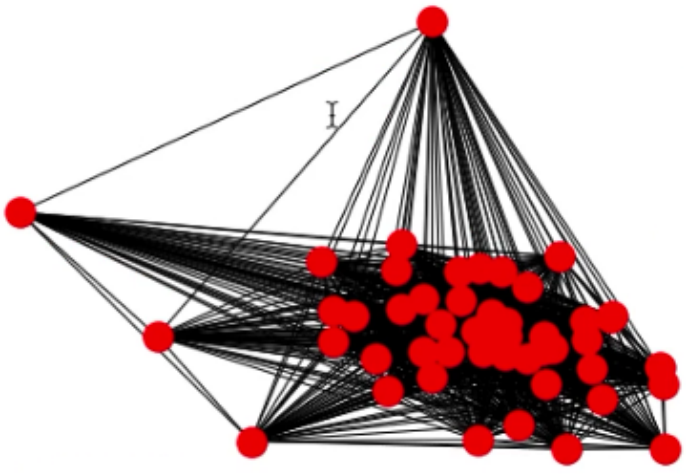
another 50 node graph G and H so these two other graphs, now I am going to draw both of them using the circular, draw using this circular layout, you must be familiar with what are layouts right, we have seen that in the previous videos, so I have given circular layout for G,
(Refer Slide Time: 01:47)

```
In [4]: nx.draw_circular(G)
```



so do you observe this graph here, now I'm going to draw another one nx.draw let's say spectral for this graph H,

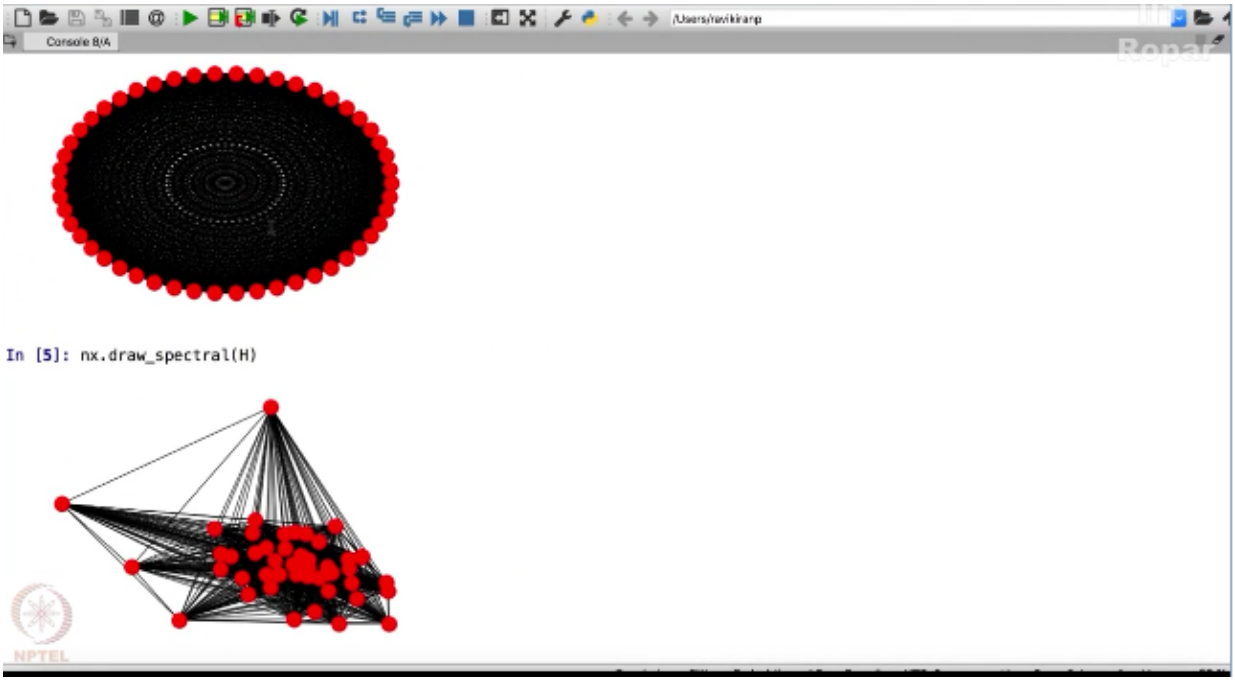
(Refer Slide Time: 02:00)



```
In [6]:
```

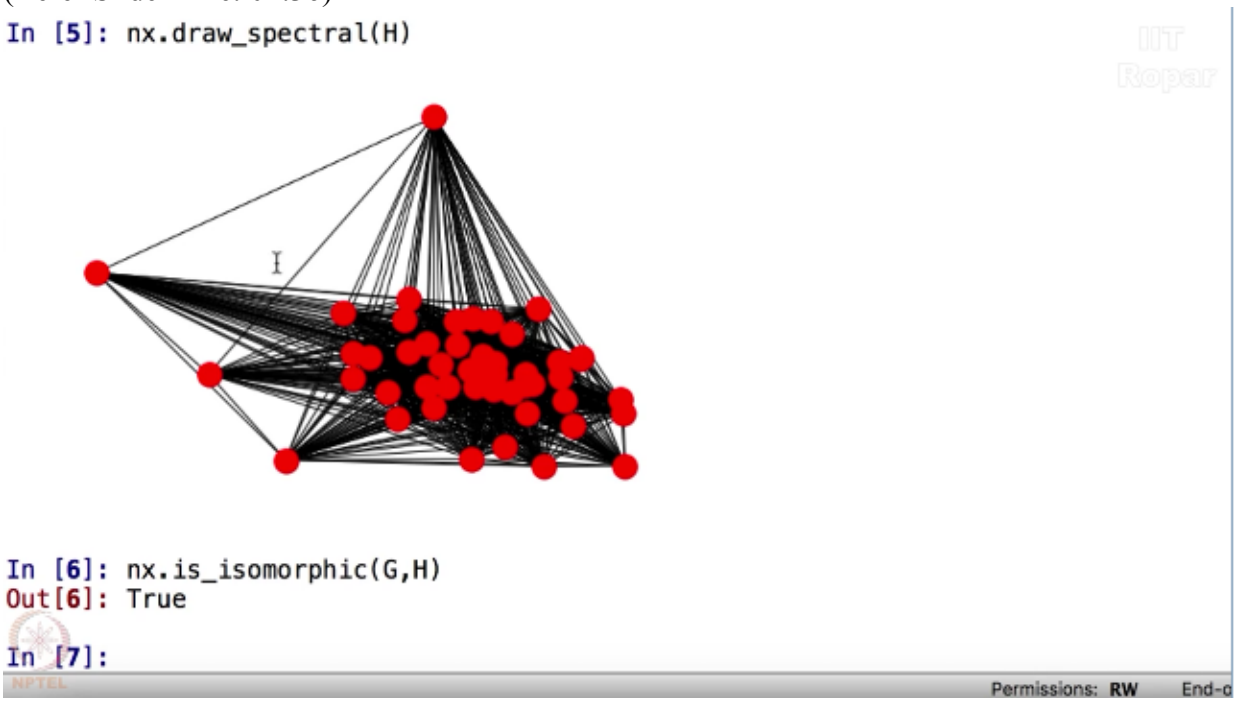
now do you see these two graphs here,

(Refer Slide Time: 02:04)



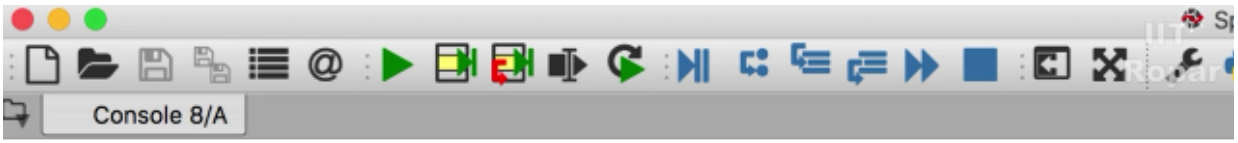

are these graphs isomorphic is the question? Of course they are isomorphic, let us see, is nx.is_isomorphic G and H, G, H, it is coming true,

(Refer Slide Time: 02:36)

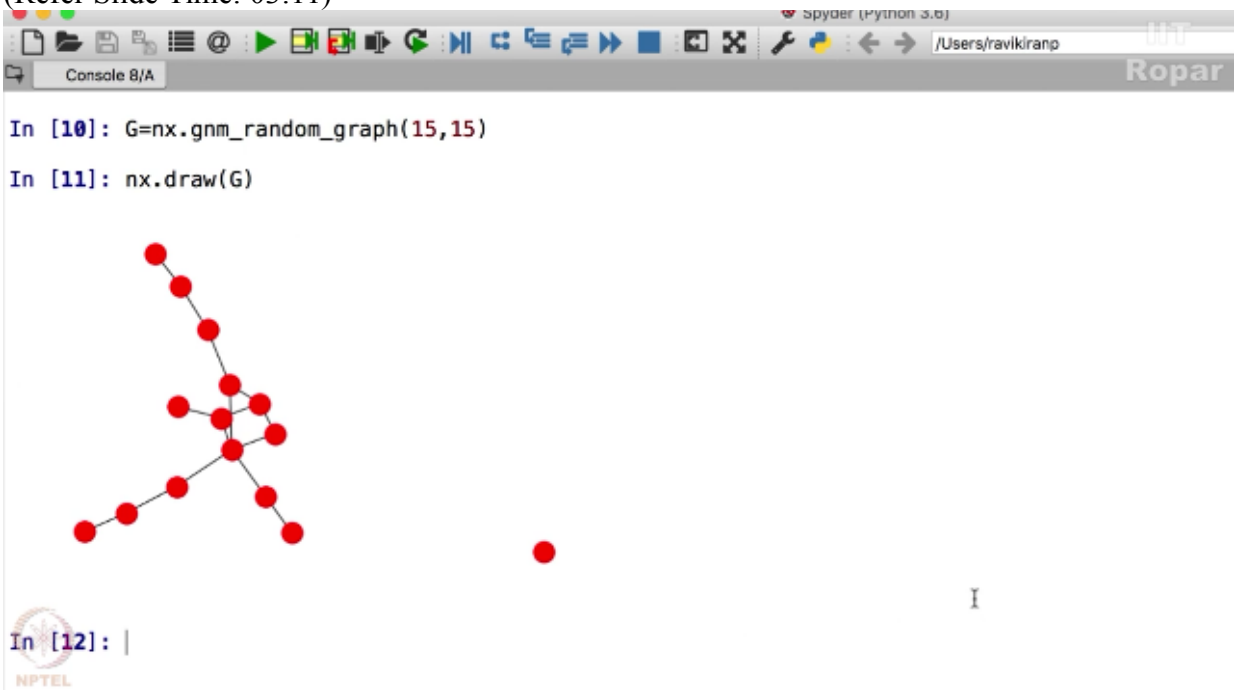



they are isomorphic, why? So I'm going to clear the screen now and we'll be continuing, I am going to now create a random graph G.nx.gnm_random_graph on say 15 nodes and 15 edges,

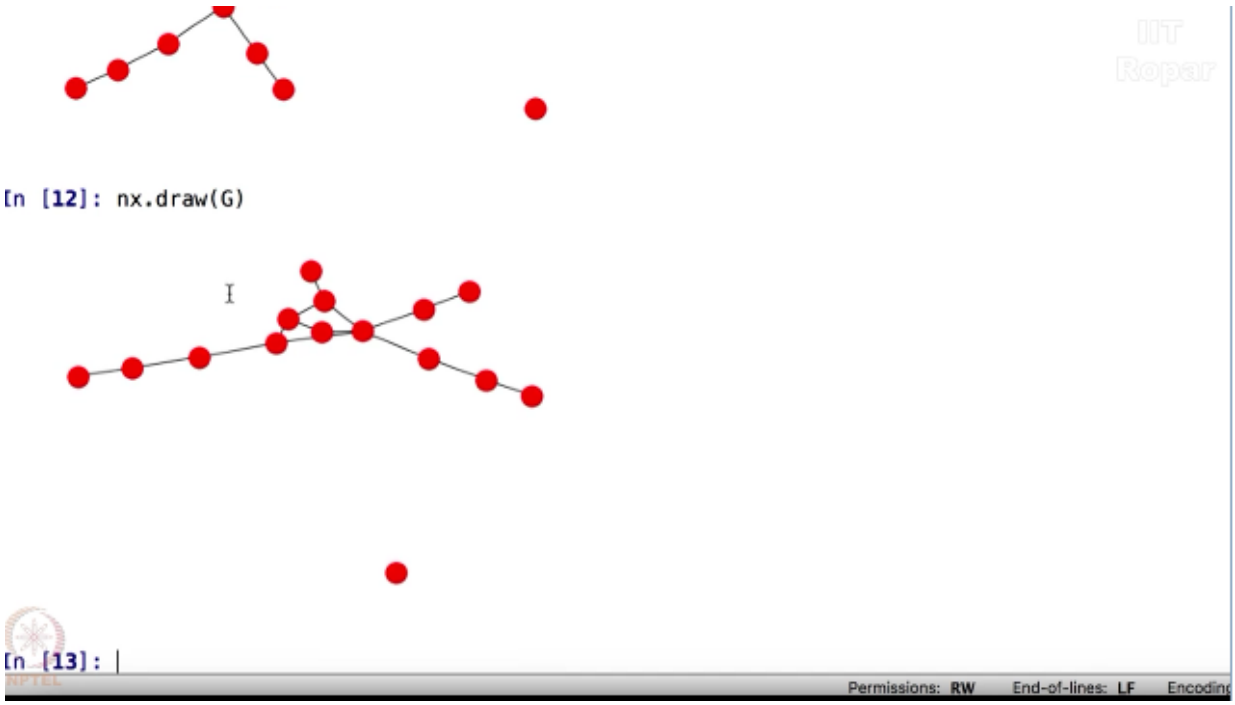
(Refer Slide Time: 03:02)




now this has got loaded right, let us see nx.draw G,
(Refer Slide Time: 03:11)



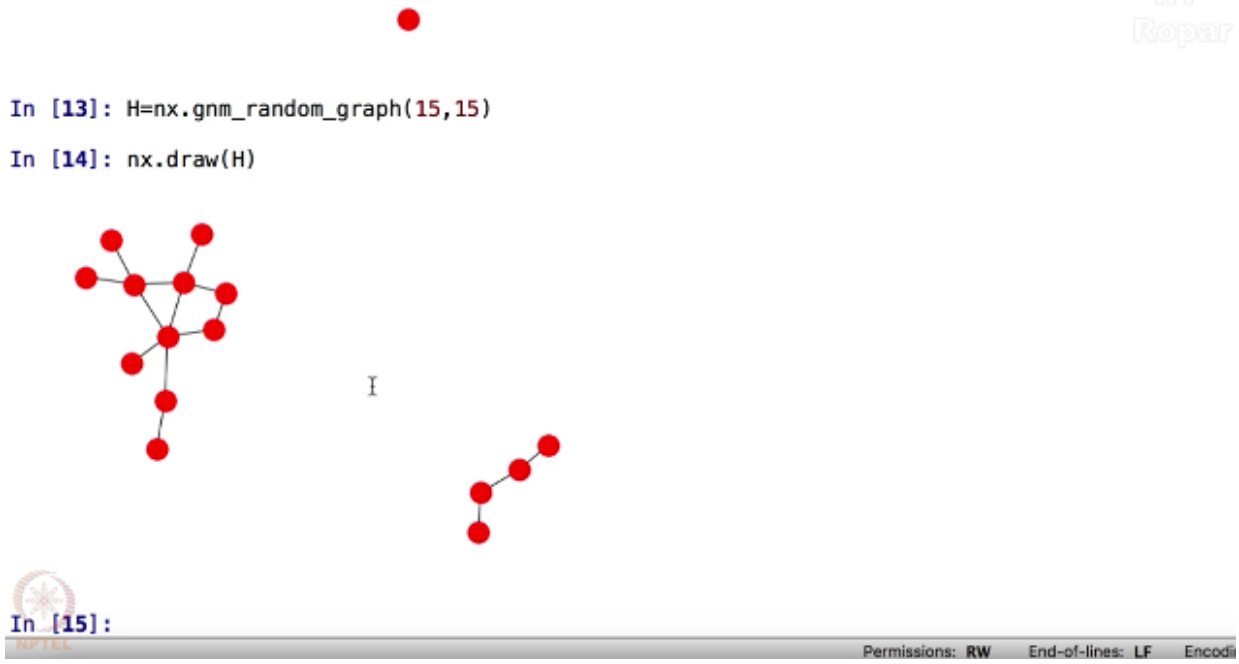

you see this is a 15 node graph with 15 edges, let us draw it again,
(Refer Slide Time: 03:19)




you see we have obtained another graph, right.

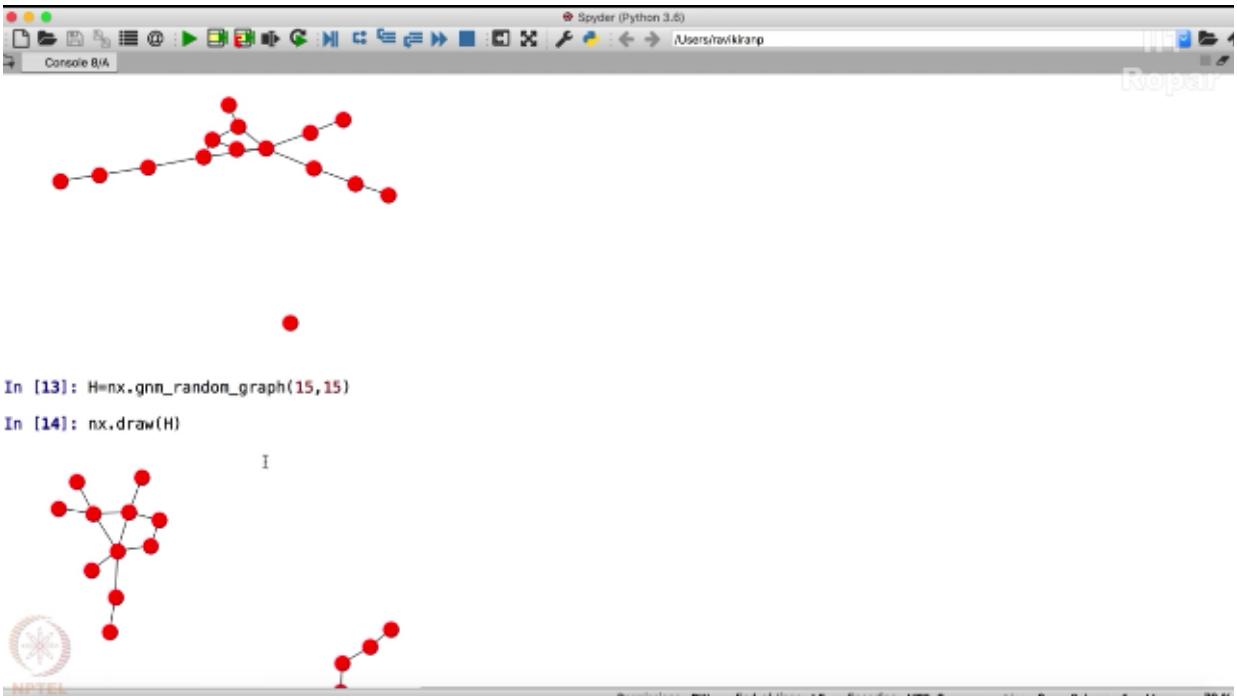
Now let me write the graph instead of G let me name it as H here right, with the same 15 nodes and 15 edges, and let me draw H,

(Refer Slide Time: 03:42)




so do you observe this H and this G, let us see if they are isomorphic? Nx.is_isomorphic G and H, it says false,

(Refer Slide Time: 04:01)




do you see why? Though the number of vertices and the number of edges in these two graphs happens to be 15, the graph is still not isomorphic, because the degree sequence is not the same you see, here there is an isolated vertex, but here you see there are 4 vertices though there are 2 components in both the graphs G and H, and hence these two graphs are not isomorphic, so you can create such a random graphs and check if these two graphs are isomorphic, you may not always get that two random graphs are isomorphic on the same number of nodes and edges.