

III Computer Networking :-

Q1) Communication :-

first communication. What is communication? When two devices or entities communicate with each other or shares the information, this is called communication.

Q2) What is computer networking :-

When a computer with another computer through any source, and share any data, information or software, it is known as computer Networking.

Q3) What are the things we can share on computer Networks ?

- 1) We can share files, software,
- 2) We can share information.
- 3) We will be stored somewhere (file) so it is preserved information.

Q4) Security :- (What is security)

- When two system communicate with each other they do so through the protocol. TCP/ UDP and HTTP, communicate through any protocol.
- The protocol takes care that their data is transferred securely and preserved it securely.

Imp. keyword → (Social Media) → (News Broadcast)
→ (Facebook, Twitter, Instagram,
E-commerce is imp.)
→ (e.g., Social Networking).

Social Networking :-

- Q. Difference bet. social Network and social Media.
- Q. Write a Note on social Networking. Explain in detail Benefits of social Networking.
- Q. Write a Note on social Media Marketing. Explain in detail Benefits of social Media Marketing.

	<u>Social Media</u>	<u>Social Networking</u>
①	social Media is a platform for <u>broadcasting</u> information	Whereas, social Networking is a platform for <u>communicating</u> with one another
②	Social Media is a <u>communications channel</u> .	In Social Networking the communication has <u>two-way nature</u> .
③	The Goal is interaction through <u>creating buzz</u> . (people talking) ^{meaning}	Build a network and also nurture <u>created relationships</u> .
④	May not have <u>timely responses</u> as it is not fully interactive.	Fosters <u>timely responses</u> as it involves direct-communication among the parties involved.
⑤	Example of Social Media :- News channel	Example of Social Networking sites or platforms include Facebook, Instagram, Twitter and LinkedIn.

Social Networking :-

- ① Social Networking refers to using internet-based Social media sites to stay connected with friends, family, colleagues, or customers.
- ② Social networking can have a social purpose, a business purpose, or both through sites like Facebook, X (formerly Twitter), Instagram, and Pinterest.
- ③ The Four main uses of Social media form the acronym SLIM : Sharing, learning, interacting and marketing.
- ④ A Social network is a specific type of website that allows users to create an online identity. Some examples include Facebook, Instagram, LinkedIn, and Google+.

Graph :-

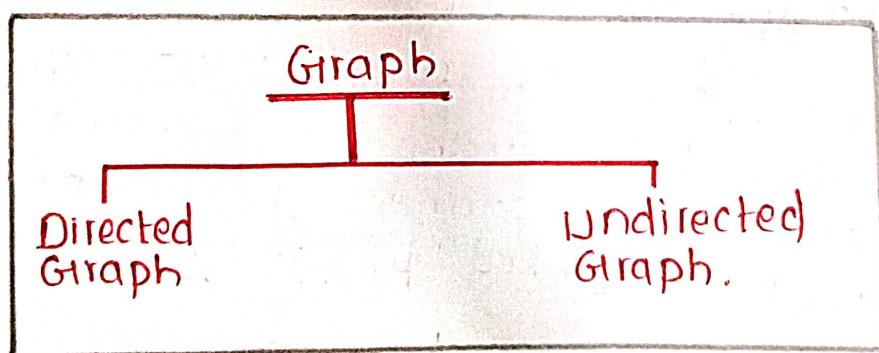
Directed and Undirected graph :-

Q. Explain : i) symmetric reln. & Asymmetric relationships.

Q. Difference betw. directed and Undirected graph.

Q. Explain in detail directed and undirected graph with example.

Q. What is Graph explain in detail.



Graph :-

- ① Graph theory, the study of Network structure.
- ② Graph is a way of specifying relationships among a collection of items.
- ③ A Graph consists of a set of objects, called nodes, with certain pairs of these objects connected by links called edges.

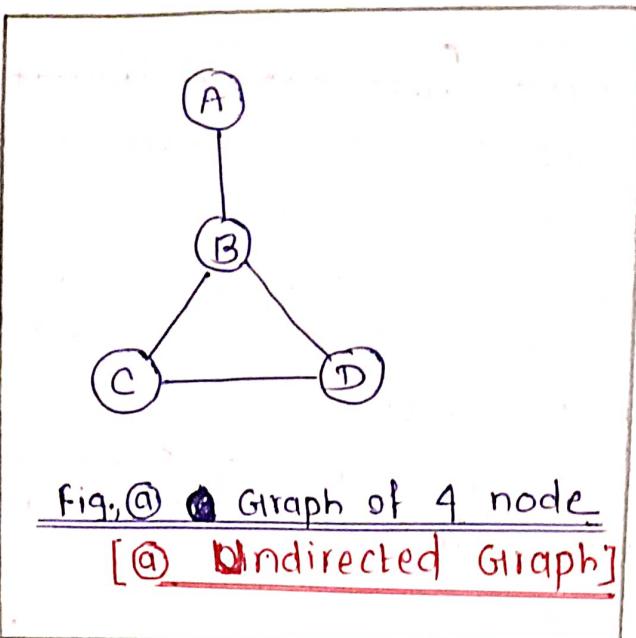


Fig., @ Graph of 4 node
[@ Undirected Graph]

ex, — Symmetric

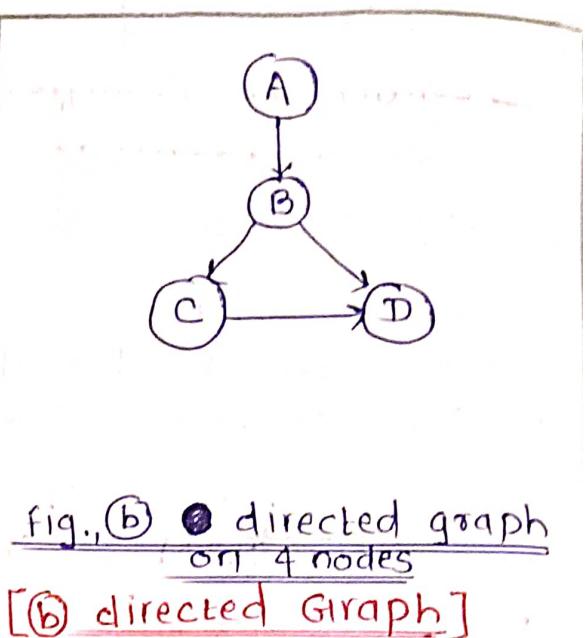


fig., b) directed graph
on 4 nodes
[b) directed Graph]

ex, — A symmetric

Fig., 2.1 : TWO graphs

(a) Undirected Graph

(b) Directed Graph

- (4) For ex., the graph in Fig., 2.1 (a) consists of 4 nodes labeled A, B, C, D with B connected to each other three nodes by edges and C & D connected by an edges as well.

- (5) We say that two nodes are neighbors if they are connected by an edge.

- (6) Fig., 2.1 shows the typical way one draws a graph — With little circles representing the node, and a line connecting each pairs of nodes that are linked by an edge.

- (7) Symmetric relationships and asymmetric relationships :- [Homework]

- (8) In Fig., 2.1 (a), you should think of the relationship bet. the two ends of an edge as being Symmetric the edges simply connects them to each other.

⑨ In many settings, however, we want to express asymmetric relationships (for ex., that A points to B but not vice-versa). For this purpose we define a directed graph to consist of a set of nodes as before, together with a set of directed edges, each directed edge is a link from one node to another with the direction being important.

⑩ Directed graphs are generally drawn as in Fig. 2.1(b) with edges represented by arrows.

⑪ When we want to emphasize that a graph is not directed we can refer to it as an undirected graph.

IMP

Undirected graph :-

Characteristics of Undirected graph :-

- symmetry
- connectivity
- Algorithm →
 - 1) Breadth First Search
 - 2) Depth - first search.

Appl' :-

- ① Social Network
- ② Traffic flow optimization

Directed graph :-

Characteristics of Directed graph :-

- symmetry
- connectivity
- Algorithm →
 - 1) Topological sort
 - 2) Dijkstra's algorithm

Appl' :-

- ① computer Network
- ② project Management

⑫ What is crawler / spider :-

⑬ Write a note on spider.

⑭ Explain in detail :-

- ① Google Page Rank Algorithm.
- ② Crawler.

⑮ A Web crawler, sometimes called a spider or spiderbot and often shortened to crawler, is an Internet bot that systematically browses the World Wide Web and that is typically operated by search engines for the purpose of web indexing (Web spidering).

⑯

- ② Web search engines and some other websites use Web crawling or spidering software to update their web content or indices of other site's web content.
- ③ Web crawlers copy pages for processing by a search engine, which indexes the downloaded pages so that users can search more efficiently.
- ④ Web crawler ex., →
 - ① Bingbot
 - ② Googlebot-Image
 - ③ Baiduspider
 - ④ DuckDuckBot

⑩ Google Page Rank Algorithm :-

- ① PageRank (PR) is an algorithm used by Google Search to rank web pages in their search engine results.
- ② It is named after both the term "Web page" and co-founder Larry Page. PageRank is a way of measuring the importance of website pages.
- ③ The Google ~~page rank~~ search algorithm is a complex system Google uses to decide how pages will rank in the search results.

⑪ Steps - by - steps Guide on How to Rank High on Google

follow these strategies for increased Google organic rankings.

- ① Step 1 → Improve Your on-site SEO
- ② Step 2 → Add LSI keywords To your Page
- ③ Step 3 → Monitor Your Technical SEO
- ④ Step 4 → Match Your content to search Intent

- Step 5 : Reduce your Bounce Rate
Step 6 : Find Even keywords to Target
Step 7 : Publish Insanely High-Quality content
Step 8 : Build Backlinks to your Site
Step 9 : Track and Monitor your Results.
Step 10 : Include Meaningful visuals.
Step 11 : Make your Information Skimmable

BONUS Step 1 — Boost your Click-Through-Rate
BONUS Step 2 — Use Internal Linking.

Home Work

Algorithm →
Code for the calculation of the Page Rank →

Marketing on social Network :-

Q. What is social Media Marketing? explain in detail Benefits of social media marketing.

OR

Q. Write a note on :

- 1) Marketing on social Networking
- 2) Link prediction



① NETWORKX

① NetworkX is a python package for the creation, manipulation, and study of the structure, dynamics and functions of complex networks.

② It provides :

- ① Tools for the study of the structure and dynamics of social, biological, and infrastructure networks.
- ② a standard programming interface and graph implementation that is suitable for many appl'.
- ③ a rapid development environment for collaborative, multidisciplinary projects;
- ④ ability to painlessly work with large nonstandard data sets.

③ With NetworkX you can load and store networks in standard and nonstandard data formats, generate many types of random and classic networks, analyse nw structure, build network models, design new network algorithms, draw networks, and much more.

④ python :-

python is a powerful programming language that allows simple and flexible representations of networks as well as clear and concise expressions of network algorithms.

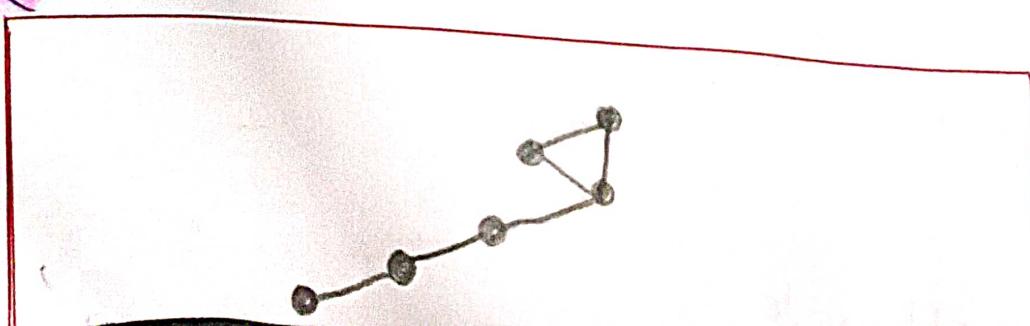
python has a vibrant and growing ecosystem of packages that NetworkX uses to provide more features such as numerical linear algebra and drawing.

⑤ program :-

```
In [13]: import networkx  
In [14]: G = networkx.Graph()  
In [15]: G.add_node(1)  
In [16]: G.add_node(2)  
In [17]: G.add_node(3)  
In [18]: G.add_node(4)
```

In[19]: G1.add_node(5)
In[20]: G1.nodes()
Out[20]: [1, 2, 3, 4, 5]
In[21]: G1.add_node(6)
In[22]: G1.nodes()
Out[22]: [1, 2, 3, 4, 5, 6]
In[23]: G1.add_edge(1, 2)
In[24]: G1.add_edge(1, 3)
In[25]: G1.add_edge(4, 6)
In[26]: G1.add_edge(5, 4)
In[27]: G1.add_edge(2, 3)
In[28]: G1.edges()
Out[28]: [(1, 2), (1, 3), (2, 3), (4, 5), (4, 6)]
In[29]: G1.add_edge(2, 6)
In[30]: G1.edges()
Out[30]: [(1, 2), (1, 3), (2, 3), (2, 6), (4, 5), (4, 6)]
In[31]: import networkx as nx
In[32]: H = nx.Graph()
Out[32]: G1.nodes()
Out[33]: [1, 2, 3, 4, 5, 6]
In[34]: G1.edges()
Out[34]: [(1, 2), (1, 3), (2, 3), (2, 6), (4, 5), (4, 6)]
In[35]: import matplotlib.pyplot as plt
In[36]: nx.draw(G1)
Fn[37]: plt.show

O/P :-



Link Prediction :-

- ① Link prediction methods anticipate the likelihood of a future connection betⁿ two nodes in a given nw.
- ② The methods are essential in social networks to infer social interactions or to suggest possible friend to the users.
- ③ At present, most link prediction alg. are based on the similarity betⁿ two entities.
- ④ social network topology information is one of the main sources to design the similarity funⁿ betⁿ entities.



Example of Networks :-

- 1) Friendship Networks ✓
- 2) Road Network U
- 3) Email Network D
- 4) Citation Network D
- 5) collaboration/ co-authorship Network D

Network Data Set's Formats :-

- 1] CSV .txt or .CSV
- 2] GML .gml
- 3] Pajek Net .NEI or .Paj
- 4] GraphML .XML
- 5] GEXF .gexf

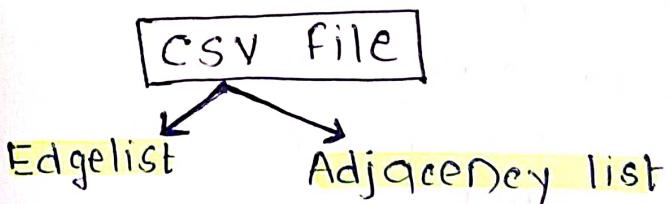
CSV Network Data set's Formats :-

→ CSV : comma separated values

Extension : .txt or .CSV

- Edgelist
- Adjacency List (Adjlist)

- ① CSV and Excel or .xls are two different file extensions containing data.
- ② Where in csv, the data is in the text format, separated by commas, While in Excel or .xls, information is in the tabular form with rows and columns.
- CSV → text format
 Excel or .xls → tabular form.
- ③ A csv file is a spreadsheet format, so it can be open by spreadsheet applications like Microsoft Excel and Google Spreadsheets. Since csv files are used to exchange large volumes of data, database programs, analytical software, and applications that can store massive amounts of information usually support the csv.
- ④ csv is arrow-based data format that is simple to read and write.
- ⑤ csv files are also easier to debug, which makes them a good choice for development and testing.



① csv Format - Edgelist :-

0	344
0	345
0	346
0	347
1	53
1	54
1	73
1	88
1	92

- 1) every Row contain two values
- 2) first value is source node second value is target node
- 3) edge 0 to 340
 edge 0 to 345
 & so on....

CSV Format - Weighted Edgelist

1	2	0.3
3	4	0.1
5	7	0.2
4	7	0.8

② CSV Format - Adjlist

1	2	5	7	→	1	to	2
2	4	6			1	to	5
3	1	4	7		1	to	7
4	6	2	3				
5	7	2					
6	1						
7	2	8	4				
8	9						
9	1	7	4	8			

② GML :-

① GML Format : Graph Modeling Language

```
graph
[
    node
    [
        id A
    ]
    node
    [
        id B
    ]
    node
    [
        id C
    ]
    edge
    [
        Source B
        target A
    ]
    edge
    [
        Source C
        target A
    ]
]
```

② GML Format With labels :-

```
graph
[
    node
    [
        id A
        label "Node A"
    ]
    node
    [
        id B
        label "Node B"
    ]
    node
    [
]
```

```
    id C  
    label "Node C"  
]  
edge  
[  
    source B  
    target A  
    label "Edge B to A"  
]  
edge  
[  
    source C  
    target A  
    label "Edge C to A"  
]  
]
```

③ GML Format with Attributes

```
graph  
[ hierarchic 1  
  directed 1  
  node  
  [ id 0  
    graphics  
    [ x 200.0  
      y 0.0  
    ]  
  ]  
  node  
  [ id 1  
    graphics  
    [ x 425.0  
      y 75.0  
    ]  
  ]  
  edge  
  [ source 1  
    target 0  
    label Graphics  
    [ text "Happy New Year"]  
  ]
```

- ① Graph Modelling Language (GML) is a hierarchical ASCII based file format for describing graphs.
It has been also named Graph Meta Language.
- ② File name extension .gml
- ③ GML (Graph Modeling language) is a text file format supporting network data with a very easy syntax.
- ④ It is used by Graphlet, pajek, YEd, LEDA and NetworkX.
- ⑤ Graph data modeling is the process in which a user describes an arbitrary domain as a connected graph of nodes and relationships with properties and labels.

Ex.

Graph Model - Nodes

John

Sally

Graph
Databases

- 1] John
- 2] Sally
- 3] Graph Databases

Graph Model - Labels

- 1] PERSON
- 2] BOOK

:PERSON
John

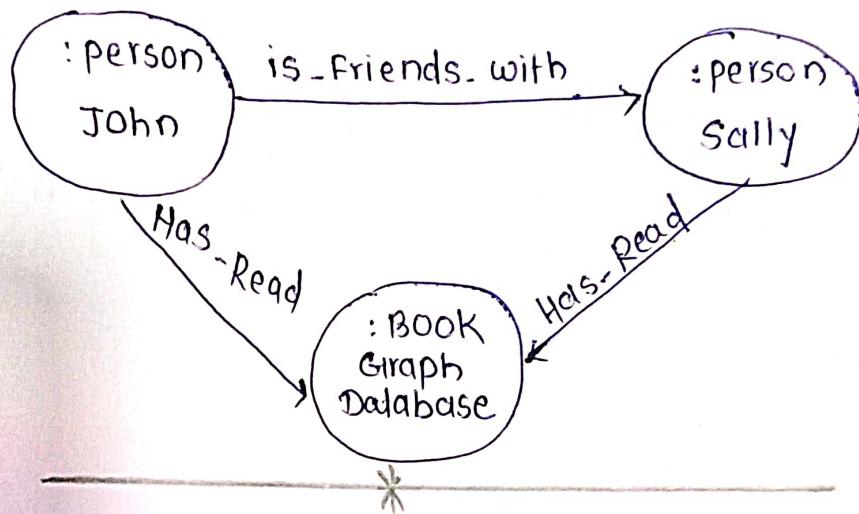
:PERSON
Sally

:BOOK
Graph
Database

3) Relationships bet. nodes :

- 1) John is friends with Sally
- 2) Sally is friends with John
- 3) John has read Graph Databases.
- 4) Sally has read Graph Databases.

4) Graph Model - Relationships.



3) Pajek Net Format : Uses .NET extension.

no. of vertices ↓ in the graphs		• paj
* Vertices	82670	
1	"entity"	* arcs
2	"thing"	4244 107
3	"anything"	4244 238
4	"Something"	4244 4292
5	"nothing"	4247 107
6	"Whole"	4248 1
7		4248 54
8		
↑ no.	↑ string (label of node)	
1 to upto n		
		↑ Source node
		↑ Target node

Structure
of
file.

* vertices 9

* Edges

1	2
1	9
2	9
2	3
2	8
3	8
3	4
4	5
4	7
5	6
5	7
6	4

ex..

* arcs

4244 107 5

↑
source
node

↑
target
node

no.

Nodes :-

Nodes have basically one unique identifier and a label.
the definition of nodes start with the chain
Vertices N Where N is the no. of nodes following.
for instance this is the begining of a pajek file of
82670 nodes. Labels are quoted directly after the
nodes identifier.

Edges :-

Edges are either def. as list of nodes identifier or
pair of two nodes. or the first case; edges are def.
as pair of nodes identifier.
The #arcs marker goes before the pairs list

arcs

4244	107
4244	238
4244	4292
4247	107
4248	1
4248	54

Weight is added by a third column, here the
Weight of the first edge is 5

arcs

4244	107	5
------	-----	---

(pajek is a program, for Windows, for
analysis and visualization of large networks
having some ten or hundred of thousands
of vertices.)

④ Graph ML :-

- ① GraphML is a comprehensive and easy-to-use file format for graphs.
- ② It consists of a language core to describe the structural properties of a graph and a flexible extension mechanism to add application-specific data.
- ③ Its main features include support of
 - o directed, undirected and mixed graphs,
 - o hypergraphs,
 - o hierarchical graphs,
 - o graphical representations,
 - o references to external data,
 - o application-specific attribute data
 - o light-weight parsers.

④ GraphML is an XML-based file format for graphs.

- 1] XML stands for extensible Markup Language
- 2] XML was designed to store and transport data.
- 3] XML was designed to be both human- and machine-readable.
- 4] XML does not use predefined Tags
- 5] HTML works with predefined tags like `<P>`, `<h1>`, `<table>`, etc.,

`<? XML version = "1.0" encoding = "UTF-8" ?>`

(UTF-8 is a character encoding system)

How to check XML file encoding

the encoding of an XML document can be given in the XML document header (the first line of the XML document).

as shown below :— `<xml version = "1.0".`

`encoding = "iso-8859-1"?>` if no encoding is given, UTF-8 is assumed.

Social Network

Assignment : 1

Week 1 :

Answer :

- ① Which of the following is the OIP of the given code segment ?

→

graph LR; A(()) --> B(()); C(()) --> D(()); E(()) --> F(()); G(()) --> H(()); I(()) --> J(()); K(()) --> L(()); M(()) --> N(());

5) GEXF

- 1) GEXF (Graph Exchange XML Format) is a language for describing complex networks structures
- 2) GEXF is an XML-based file format for storing a single undirected or directed graph.
- 3) extension → .gexf