Unit - I

- Introduction to Adhoc Network.
- Characteristics of MANET.
- Applications of Adhoc Network.
- Challenges in Adhoc Network.

* Routing in Adhoc Network.
  - Topology based routing Protocols
    - Proactive Routing Approach :
      - Destination sequenced distance vector Protocol [DSDV]
      - Wireless Routing Protocol.
      - Topology broadcast based on Reverse Path forwarding Protocol.
      - The optimized link state routing Protocol.
      - Source tree adaptive routing protocol.
    - Reactive Routing Approach :
      - Dynamic Source Routing
      - Adhoc ondemand distance vector protocol
      - link reversal routing & TORA.

Adhoc

Unit - 1

1) Introduction to Adhoc network.

- Also known as
  - MANET (Mobile -Adhoc network)
  - WANET

- Defination :

" A wireless Ad-hoc network is a type of local area network that is built spontaneously to enable connection without a control device. "

- Key points :
  - Wireless Network.
  - No fixed infrastructure.
  - Dynamic Topologies
  - Node in MANET can act as both HOST or ROUTER
  - MANET is a autonomous collection of mobile users that communicate over wireless link

- Characteristic

  - Dynamic topologies
  - Energy - constrained nodes
  - limited Bandwidth
  - Security Threats.

- Properties :

  - Fast network · Establishment
  - Peer to peer connectivity
  - Wireless connection
  - No require · of access point.

-

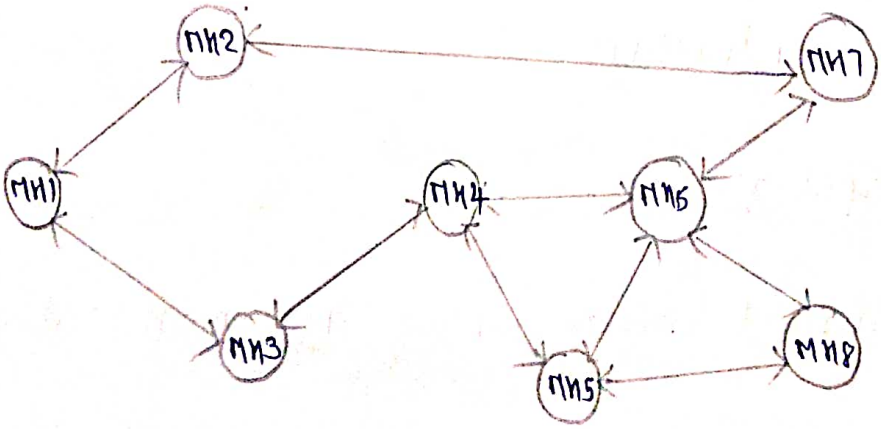


figure) A mobile adhoc Network (MANET)

4) Characteristics of MANET.

① **Dynamic Topologies:**

- Network topology which is typically multihop may change randomly & rapidly with time.
- It can be form Unidirectional or bi-direction links.

② **Energy constrained operation:**

- All nodes ~~repto~~ rely on batteries.
- important thing, Energy conservation.

③ **Limited Bandwidth:**

- Wireless links usually have lower compared to wired network.
  - Reliability
  - efficiency
  - stability
  - capacity

④ **Security Threats:**

- fixed cable network have more security than Mobile wireless network.

3) Application of Adhoc network.

① Collaborative work:

- for some businesses the need for collaborative computing may be more important. where people have need outside meetings to cooperate & exchange ~~infection~~ information.

② Crisis Management Application:

- In natural disasters where the entire communication infrastructure is ~~in~~ destroyed. And restoring communication quickly is essential so by using adhoc network an infrastructure could be set up in hours. instead of days/weeks required for wire-line communication.

③ VANET

- Vehicular adhoc network group of moving vehicles connected by wireless network.

Provides safety & comfort to drivers. Also provides smart traffic control & real time information, dynamic route scheduling, condition monitoring.

④ Personal Area Network :

- Personal area network is a short range, local network. where nodes are associated with given person. These nodes can be attached to phone, laptop, TV etc.

- Example :

  - Bluetooth
  - WiGig

4) Challenges in Adhoc network.

- Scalability
- Quality of service
- Client server model shift
- Security
- Interoperation with the internet
- Energy conservation
- Node cooperation

① Scalability :

- Adhoc network suffer from the scalability Problems in capacity.
- limited number of nodes (100 - 200) nodes in a field.

② Quality of Service :

- Voice, live video & file transfer this application having different requirements
- Quality of service (QoS) aware solution is being developed to meet the requirements of these applications.

③ Security :

- fixed cable network have more security than mobile wireless network.
- lack of any centralized network management.

④ Interoperation with the internet .

- The most common applications of Adhoc networks is that it require some internet connectivity.

⑤ Energy conservation.

- All nodes rely on batteries.
- Maximization of lifetime of a single buttery
  & maximization of ~~whole~~ the lifetime of the whole network.

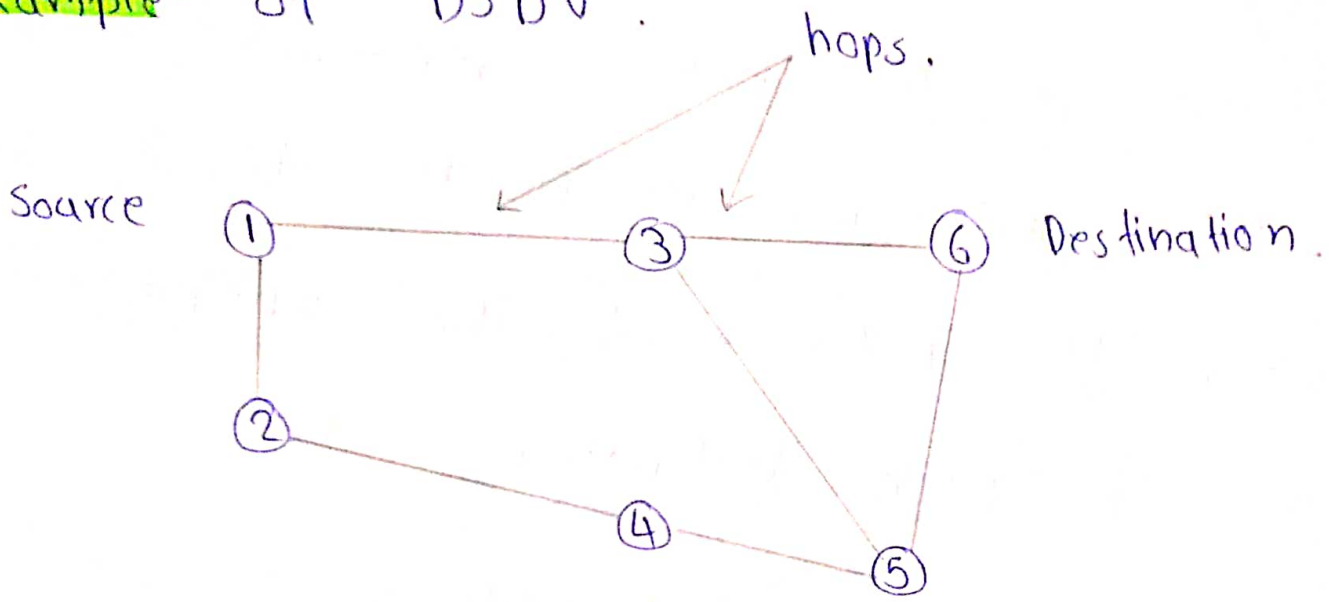
5) Destination Sequenced Distance Vector Protocol.

- In this routing protocol, every Mobile Host [MH] in the network maintains a routing table for all possible destinations within the network & the number of hops to each destination.
- Each entry is marked with a sequence number assigned by the destination [MH] Mobile host.
- Routing table updates are periodically transmitted throughout the network in order to maintain consistancy in the tables.
- In this routing protocol two types of packs can be employed.

(i) Full dump

(ii) Small increament packets.

Example of DSDV :

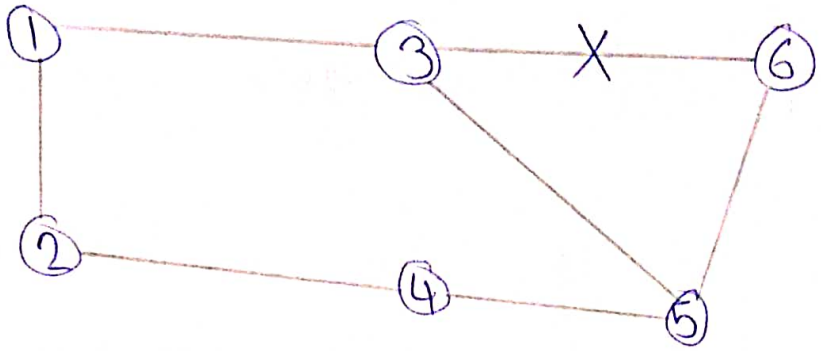


Routing table for node 1

Node 1

Destination	Next Node	Distance
6	3	2
5	3	2
4	2	2
3	3	1
2	2	1

If the link breaks between two nodes. That node becomes infinite.



It will selects the

Path 1 — 3 — 5 - 6

instead of 1 - 3 - 6

Now Routing table for Node 1

Destination	Next Node	Distance.
6	3	3
5	3	2
4	2	~~3~~ 2
3	3	1
2	2	1

6) Wireless Routing Protocol

- It is a table driven protocol with the goal of maintaining routing information among all nodes in the network.
- Each node in the network is responsible for maintaining (four) 4 tables :
  1. Distance table
  2. Routing table
  3. link cost table
  4. Message Retransmission list.

1) Distance table :

- It contains network view of the neighbours of the nodes.
- Distance & predecessor node for all destinations as seen by each neighbour.

2) Routing table :

- It contains view of the network for all known destinations including :
  - Shortest distance to destinations.
  - Predecessor node.
  - Successor node

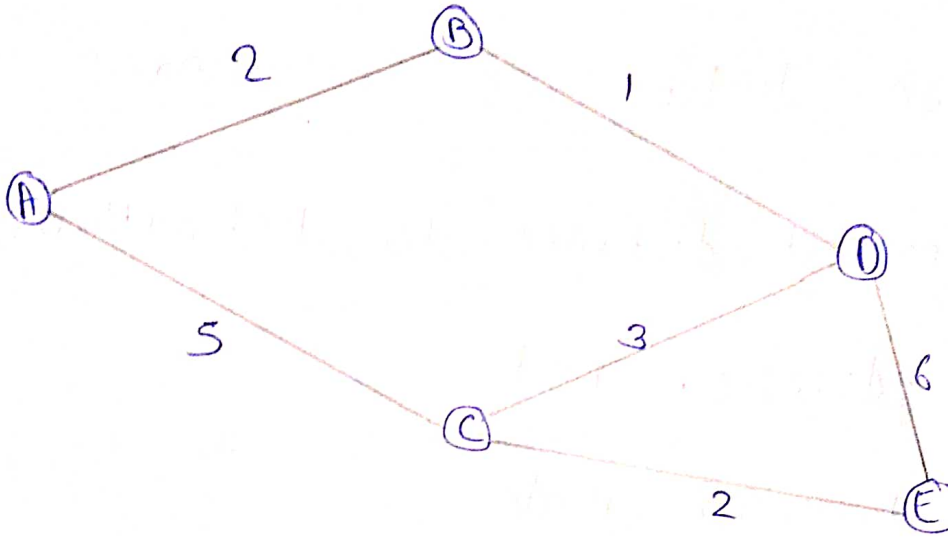
3) link cost table :

- Containing cost related information including:
  - number of hops to reach destination.

4) Message Retransmission list [MRL] :

- Containing counter for each entry.

Example :



Routing table of node 'A' with destination 'E'

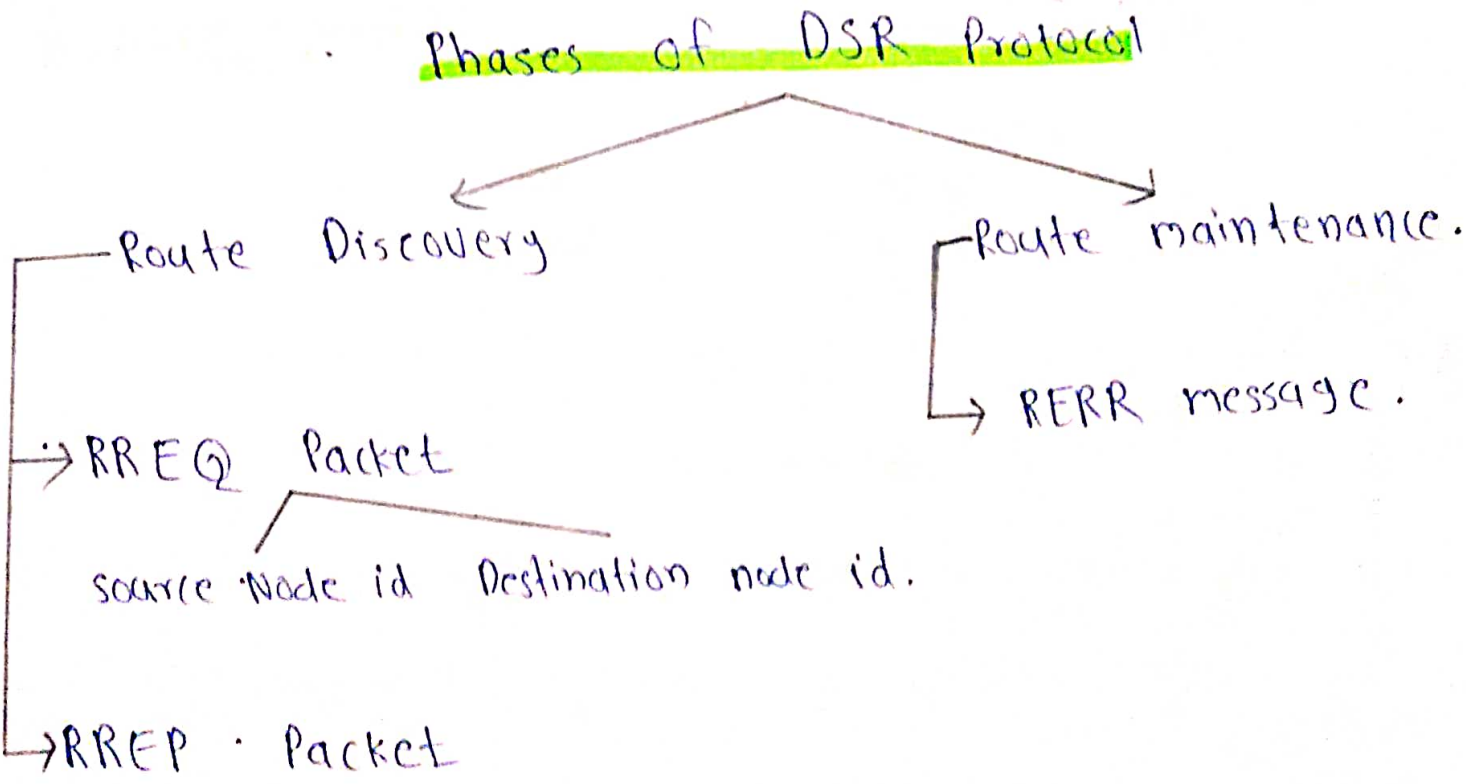
Node ID	Next hop	Predecessor	cost
A	C	C	7
B	D	C	6
C	E	E	2
D	C	C	5
E	E	E	0

Dynamic Source Routing.

- Discovers the route between source and destination when required.
- Operation is based on Source Routing.

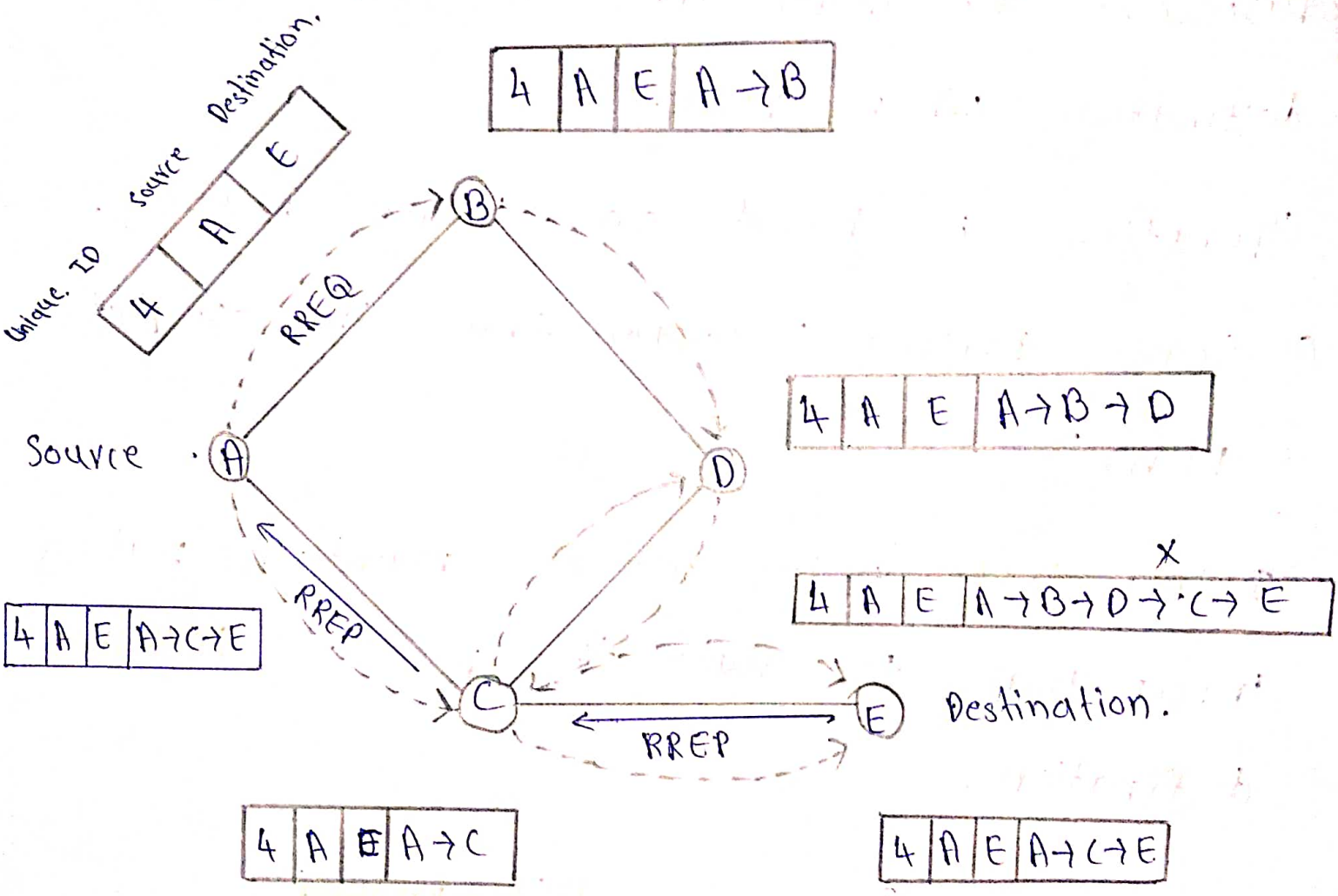
(Source Routing : sender knows the complete Path.)

- Intermediate nodes do not maintain routing information to route the packets to the destination.



- Dynamic source Routing Protocol uses Route cache to store the path.

:- Example : of Dynamic Source Routing (DSR

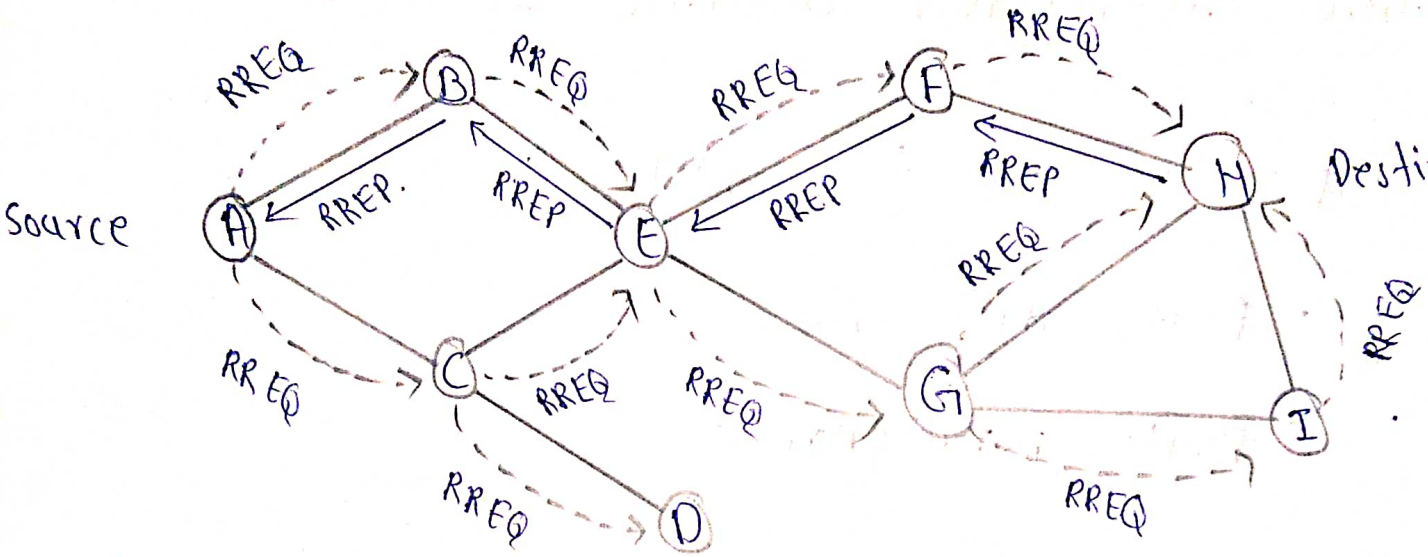


8) Adhoc On-Demand distance vector Protocol [AO

- It operates on two phases :
  - Route discovery
  - Route maintenance
- Source node will not carry the complete path.
- Each node only knows its previous & next hop information.
- Each node maintains Route cache.
- Route Discovery :

RREQ :

- Source Node ID
- Destination node ID
- Recent sequence number
- Broadcast ID
- Hop count
- Time to ~~live~~ leave. (TTL).



Route 1 selected.

Route 1 : A → B → E → F → H } 4 hop count

Route 2 : A → C → E → G → H } 4

Route 3 : A → C → E → G → I → H } 5

9) TORA (Temporally ordered Routing Algorithm)

- The Temporally ordered Routing Algorithm TORA is an algorithm for routing data across wireless Mesh Networks or mobile adhoc Networks.
- TORA is also characterized by a multi-path routing capability.

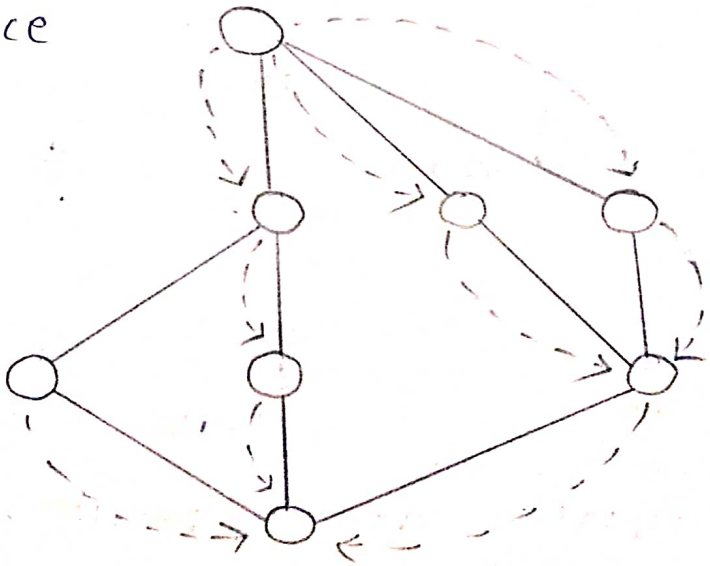


figure) TORA Height Matric

- TORA has 3 main functions :

① Route establish.

② Route Maintenance.

③ Route erasure.

* Route establishment :

- Function is performed only when a node requires a path to a destination but does not have any directed link.

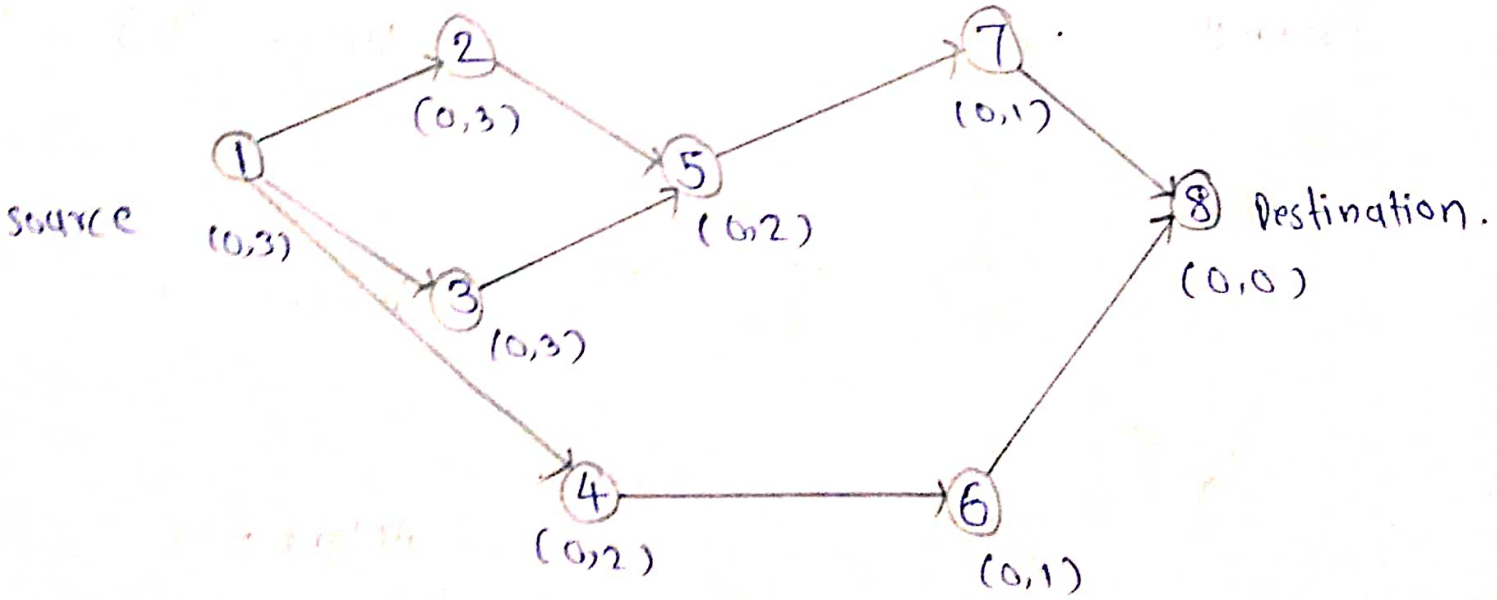


figure: Node's height updated as a Result of the Update message.