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1. **Forwarding** is router-local action of transferring the packet from an input link interface to the appropriate output link interface.

   Routing refers to the network-wide process or global action that determines end-to-end paths that packets take from source to destination.

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   Usually routing runs continuously to establish the routing tables before the packets are forwarded and in anticipation of packets.

2. Data Plane Functionality is forwarding from input port to the correct output port in the router or forward packets between clients. Control plane Functionality is routing from source to destination which is responsible for establishing connection to exchange routing and forwarding information by using routing tables to find shortest path between the clients. And data plane uses the forwarding table of the control plane to transfer data from one client to another.

   Data Plane
   - forwards traffic
   - switching
   - go through router

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   Control plane
   - makes decisions where traffic is sent
   - routing protocols

3. In Destination based routing, a route is established between destination and source based on destination address using that a forwarding table is constructed. Basically, router forwards data using destination IP address.

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   In Generalized routing, a controller or network admin performs match plus action table entries for each switch in a network. This will route data using header field values.

4. A DHCP server is usually included with a wireless router. DHCP is used to assign IP addresses to the five PCs and the router interface. And yes, the wireless router uses NAT because it receives just one IP address from the ISP.

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5.

Distance vector Routing:

- It is a dynamic routing algorithm in which each router computes a distance between itself and each possible destination i.e., its immediate neighbours.
- The router shares its knowledge about the whole network to its neighbours and accordingly updates the table based on its neighbours.
- The sharing of information with the neighbours takes place at regular intervals.
- It makes use of **Bellman-Ford Algorithm** for making routing tables.
- **Problems**
  - Count to infinity problem which can be solved by splitting horizon.
  - Good news spread fast and bad news spread slowly.

- Persistent looping problem i.e., loop will be there forever.

Link state routing:

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- It is a dynamic routing algorithm in which each router shares knowledge of its neighbours with every other router in the network.
- A router sends its information about its neighbours only to all the routers through flooding.
- Information sharing takes place only whenever there is a change.
- It makes use of **Dijkstra's Algorithm** for making routing tables.
- **Problems**
  - Heavy traffic due to flooding of packets.
  - Flooding can result in infinite looping which can be solved by using the **Time to live (TTL)** field.

6. The intra-routing algorithm of the AS (Autonomous systems) is employed to describe the least-cost path from each router (internal router) to the gateway. It is not necessary that every autonomous system should use the same intra-autonomous system routing algorithm because each autonomous system has administrative control over routing within the AS. Throughout the autonomous systems, all routers are connected via the same intra-autonomous routing protocol, but the autonomous routing protocol can link the autonomous systems to other autonomous systems. It means the ASs run the same inter-AS routing protocol among themselves. Therefore, it is not necessary that every autonomous system employs the same intra-AS routing algorithm.

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7.

A) link A is never used, so we cannot determine the cost of X, so the answer is n/a
B) The prior node in the path to X is V, and we know the shortest distance of both V (0) and X (3), so 3 - 0 = 3 which is Y

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8.

A) If algorithm starts from U to all routers, then the resultant coverage will be: (u, v, w, x, y). = (0, 9, 14, 10, 15)
B) Count to infinity problem

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