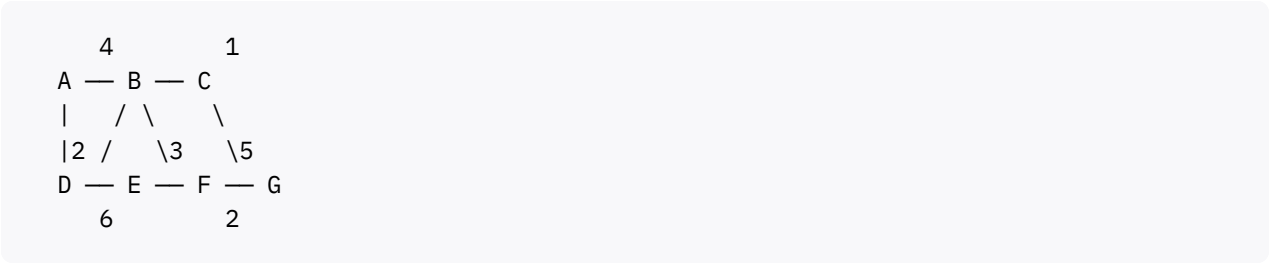
# Practice Problems and Examples for All Routing Algorithms

## 1. Shortest Path Algorithm (Dijkstra's)

**Example Network:**

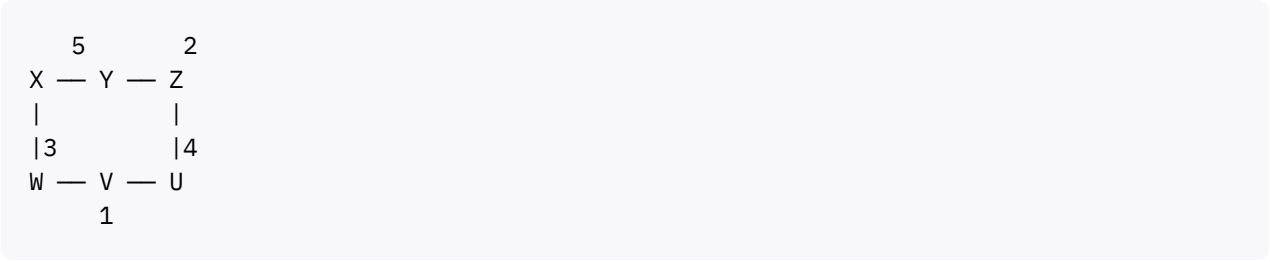



Problems:

1. Starting at A, use Dijkstra's algorithm to find the shortest path and distance from A to every other node.
2. Show the step-by-step table of distances and predecessors.
3. After you compute, what is the shortest path from A to G and its total cost?

## 2. Distance Vector Routing (DVR)

**Example Topology:**




Problems:

1. Initialize each router's distance vector table (distances to all others).
2. Simulate one iteration of vector exchanges: show updated vectors for X, Y, Z, W, V, U.
3. Demonstrate the Count-to-Infinity problem when the link Y–Z fails: show two rounds of updates.

### 3. Count-to-Infinity Problem

**Simple Scenario:**

```
A —— B —— C
Costs: 1 each
```

Problems:

1. Show initial distance vectors for A, B, C.
2. Simulate link B–C failure and two subsequent rounds of DVR updates to illustrate how costs "count to infinity."
3. Apply Split Horizon with Poison Reverse: show how tables converge correctly in one round.

### 4. Link State Routing (LSR)

**Example Topology:**

```
   2       3
R1 —— R2 —— R3
 |              \
 |4              \1
R4 —— R5 —— R6 —— R7
      5
```

Problems:

1. For R1, list its Link State Packet containing neighbor costs.
2. Flood these packets to all routers. Show the final network map each router holds.
3. Run Dijkstra's at R1 to compute shortest paths to all routers, detailing each iteration.

### 5. Path Vector Routing (BGP)

**Autonomous Systems (AS):**

```
AS100 — AS200 — AS300 — AS400
   |                |
   +—— AS500 ———+
```

Problems:

1. At AS100, list the initial routing table entries (destination AS and AS_PATH).
2. Simulate an update: AS200 advertises a new path to AS400 via AS300. Show AS_PATH changes at each AS.
3. Introduce a policy: AS200 refuses paths containing AS500. Show which paths are accepted or rejected.

## 6. Hierarchical Routing

**Large Network Divided into Regions:**

```
Region A: R1, R2, R3
Region B: R4, R5
Region C: R6, R7, R8, R9
```

Problems:

1. Draw the two-level hierarchy: routers in each region plus inter-region connections.
2. Construct a routing table at R1 showing entries for its own region vs. other regions.
3. Explain how a packet from R1 to R9 is routed using inter-region summary entries.

## 7. Flooding Algorithm

**Broadcast Example:**

```
      A
     / \
    B   C
    |   |
    D — E
```

Problems:

1. Simulate uncontrolled flooding of a packet originating at A with TTL = 3. List all transmissions.
2. Apply Sequence Number Controlled Flooding: show how duplicates are suppressed.
3. For selective flooding toward E, identify which neighbors forward the packet.

These problems cover every routing algorithm type in detail. Work through each step methodically, drawing tables and diagrams as needed to ensure full understanding. Good luck!

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1. M23DE0203_3007_Unit-3.pdf
2. image.jpg
3. WhatsApp-Image-2025-09-15-at-18.44.37_b5e4b3c3.jpg
4. Computer-Networks_Assignment-2.xlsx