Unit 3 Network Layer - Intensive Study Plan

Based on your course materials and assignment questions, here's your strategic approach to master Unit 3 topics for tomorrow's exam:

Phase 1: High-Priority Topics (2 hours)

1. Routing Algorithms (45 minutes) - CRITICAL

Shortest Path (Dijkstra's Algorithm) - 20 minutes:

- **Algorithm Steps**: Mark source as 0, others as infinity → Select minimum unvisited → Update neighbors → Mark visited[1]
- **Practice the example** from your textbook step-by-step[1]
- **Key Formula**: For each neighbor N: New_distance = Current_distance + Edge_weight
- **Memory Aid**: Think of it as finding the cheapest route on a map

Distance Vector Routing (DVR) - 15 minutes:

- **Bellman-Ford Formula**: `Dx(y) = min{C(x,v) + Dv(y)}`[1]
- **Count-to-Infinity Problem**:[1]
  - **Problem**: Routers feed each other incorrect information when links fail
  - **Solutions**: Route poisoning (advertise infinity), Split horizon rule
- **Practice**: Work through routing table updates with network topology

Path Vector Routing - 10 minutes:

- **Key Concept**: Maintains full path information to prevent loops[1]
- **BGP Example**: Inter-domain routing between Autonomous Systems[1]
- **Phases**: Initiation → Sharing → Updating[1]

2. Connection-oriented vs Connectionless Services (30 minutes)

Create This Comparison Table:[1]

Feature	Connection-oriented (TCP)	Connectionless (UDP)
Setup	3-way handshake required	No setup needed
Reliability	Guaranteed delivery, sequencing	Best-effort, no guarantees

Feature	Connection-oriented (TCP)	Connectionless (UDP)
Example	Telephone call	Postal service
Overhead	High	Low
Applications	File transfer, email	DNS, streaming
Route	Same path for all packets	Different paths possible

Practice Drawing:[1]

- Connection-oriented: Client ↔ Server with established path
- Connectionless: Multiple packets taking different routes

3. Congestion Control Algorithms (45 minutes)

Leaky Bucket Algorithm:[1]

- **Concept**: Water bucket with hole at bottom - constant output rate
- **How it works**: Packets enter bucket → Leave at fixed rate → Drop if bucket full
- **Use**: Smooths bursty traffic to constant rate

Token Bucket Algorithm:[1]

- **Concept**: Tokens added at constant rate, packets consume tokens
- **Key Parameters**: Token generation rate (r), Bucket capacity (B)
- **Advantage**: Allows controlled bursts unlike leaky bucket

Practice: Draw both algorithms and explain the difference - leaky bucket = constant output, token bucket = allows bursts

Phase 2: Secondary Topics (1.5 hours)

4. Network Layer Fundamentals (30 minutes)

Key Functions:[1]

- **Logical Addressing**: IP addresses for packet delivery
- **Routing**: Path determination using algorithms
- **Packet Forwarding**: Moving packets to correct output interface
- **Fragmentation**: Breaking large packets when needed

Routing vs Forwarding:[1]

- **Routing**: Decision-making process (building routing tables)
- **Forwarding**: Action of moving packets (looking up and sending)

5. Quality of Service (QoS) (30 minutes)

QoS Parameters:[1]

- **Bandwidth**: Data transmission capacity
- **Latency/Delay**: Time for packet to travel source to destination
- **Jitter**: Variation in packet arrival times
- **Packet Loss**: When network drops packets due to congestion

Types: Stateless (no per-flow state) vs Stateful (maintains flow information)[1]

6. IPv4 vs IPv6 (30 minutes)

Quick Comparison:[1]

Aspect	IPv4	IPv6
Address Length	32 bits	128 bits
Format	Dotted decimal (192.168.1.1)	Hexadecimal (2001:db8::1)
Address Space	~4.3 billion	Almost unlimited
Header Size	Variable 20-60 bytes	Fixed 40 bytes
Security	Optional	Built-in IPSec
Broadcast	Supported	Not supported (uses multicast)

Phase 3: Practice & Application (1 hour)

Algorithm Practice (30 minutes)

1. **Work through Dijkstra's example** from your notes step by step
2. **Practice DVR table updates** with a 3-4 node network
3. **Draw congestion control algorithms** with packet flow

Assignment Question Practice (30 minutes)

1. **Sketch connection-oriented vs connectionless** diagrams
2. **Practice QoS parameter explanations** with real-world examples
3. **Prepare IPv4 vs IPv6 comparison** in table format

Phase 4: Final Review (30 minutes)

Memory Consolidation Techniques

Create Mental Maps:

- **Routing Algorithms**: Dijkstra's (shortest path) → DVR (distance vector) → Path Vector (BGP)
- **Congestion Control**: Open-loop (prevention) → Closed-loop (reaction)
- **Services**: Connection-oriented (reliable, like phone) → Connectionless (fast, like mail)

Key Formulas to Remember:

1. **Dijkstra's**: New_distance = Current_distance + Edge_weight
2. **DVR**: `Dx(y) = min{C(x,v) + Dv(y)}`
3. **Token Bucket**: Burst size = Bucket capacity

Exam Day Strategy

High-Probability Questions:

1. **Dijkstra's algorithm calculation** - Know the steps by heart
2. **TCP vs UDP comparison** - Create comparison table
3. **Congestion control algorithms** - Draw diagrams
4. **Count-to-infinity problem** - Explain with example and solutions

Time Allocation During Exam:

- **Algorithm questions**: Show all steps clearly
- **Comparison questions**: Use tables for clarity
- **Diagram questions**: Draw clear, labeled diagrams

Quick Reference for Tomorrow:

- **Dijkstra's Steps**: Initialize → Select minimum → Update neighbors → Mark visited → Repeat
- **DVR Solutions**: Route poisoning + Split horizon
- **QoS Parameters**: Bandwidth, Delay, Jitter, Packet Loss
- **Bucket Algorithms**: Leaky (constant rate) vs Token (allows bursts)

Focus intensively on routing algorithms and congestion control as these appear to be heavily weighted in your assignment questions. Practice drawing diagrams for all algorithms - visual representation often carries significant marks in network courses.

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

5. Computer-Networks_Assignment-2.xlsx