CSE 422 Final Review

1. Introduction
    - **a.** What is the Internet, what is a protocol, network structure
    - **b.** Network edge: end systems, access networks, links
    - **c.** Network core: packet switching, circuit switching, network structure
    - **d.** Performance: delay, loss, throughput in networks
    - **e.** Protocol layers, service models
    - **f.** Security: networks under attacks
    - **g.** History of the Internet.

2. Application layers
    - **a.** Principles of network applications, client server and P2P architectures
    - **b.** Web and HTTP, web caching
    - **c.** Email: SMTP, POP3, IMAP
    - **d.** DNS, iterated query vs recursive query, caching
    - **e.** P2P applications, BitTorrent
    - **f.** Video streaming and content distribution networks

3. Transport Layer
    - **a.** Transport layer services
    - **b.** Multiplexing and demultiplexing
    - **c.** Connectionless transport: UDP; checksum
    - **d.** Principle of reliable data transfer, go-back-n vs selective repeat
    - **e.** Connection-oriented transport: TCP

      Segment structure, reliable data transfer, flow control, connection management
    - **f.** Principle of congestion control
    - **g.** TCP congestion control: AIMD

4. Network Layer: The Data Plane
    - **a.** Network layer: data plane, control plane
    - **b.** Inside a router:
      input port/output port, forwarding table, longest prefix matching, switch fabrics, buffering, scheduling
    - **c.** Internet Protocol: IP
      Datagram format, fragmentation, IPv4, DHCP, network address translation (NAT), IPv6
    - **d.** Generalized forward and SDN
      Match, action, Openflow examples of match-plus-action in action

5. Network Layer: The Control Plane
    - **a.** Network layer functions and control plane
    - **b.** Routing protocols: Link state (Dijkstra), distance vector (Bellman-Ford)
    - **c.** Intra-AS routing in the Internet: OSPF (Link state, dijkstra)
    - **d.** Routing among ISPs: BGP (eBGP, iBGP, policy-based routing)
    - **e.** SDN control plane
    - **f.** the Internet control message protocol: ICMP
    - **g.** Network management, SNMP

6. Link Layer
    - **a.** Link layer and its services
    - **b.** Error detection, error correction, Cyclic redundancy check (CRC)
    - **c.** Multiple access protocols (MAC protocols)
        - Channel partitioning: TDMA, FDMA
        - Random access: slotted ALOHA, ALOHA, CSMA, CSMA/CD, CSMA/CA
        - Taking turns: polling, token passing
    - **d.** LANs: MAC addresses, ARP, Ethernet, switches (self-learning), VLANS
    - **e.** Link virtualization: MPLS
    - **f.** Data center networking
    - **g.** A day in the life of a web request