COMPUTER NETWORKS
MID-TERM DETAILED SYLLABUS

1. Introduction Concepts
1. Goals and Applications of Networks
2. Network Structure and Architecture
3. The OSI Reference Model and Services
4. Network Topology Design and Delay Analysis
5. Physical Layer Transmission Media
6. Switching Methods

2. Data Link Layer
1. Sliding Window Protocols
   - Go-Back-N Protocol
   - Selective Repeat Protocol
   - Stop-and-Wait Protocol
2. Error Handling Techniques
   - Error Detection
     - Parity Check
     - Hamming Distance
     - Cyclic Redundancy Check (CRC)
3. Framing
   - Bit Stuffing
   - Byte Stuffing

4. Medium Access Sublayer
1. Medium Access Sublayer Overview
2. Channel Allocations
4. ALOHA Protocols
5. CSMA
6. CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
7. CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)

5. Network Layer
1. Network Layer Overview
2. IP Packet and IP Address
   - Classful Addressing
   - Classless Addressing
   - Subnetting
3. IPV4 Header
   - Fragmentation
4. Routing Protocols
   - RIP (Routing Information Protocol)
   - OSPF (Open Shortest Path First)
   - BGP (Border Gateway Protocol)

6. Transport Layer

- Connection-oriented vs. connectionless communication.
- Services the Transport Layer provides include segmentation, multiplexing, flow control, and error detection/correction.
- TCP (Transmission Control Protocol) - Header structure and fields.
  - Reliable, connection-oriented protocol.
  - Three-way handshake, sliding window mechanism, congestion control algorithms, and connection termination.
- UDP (User Datagram Protocol) - Header structure and fields.
  - Unreliable, connectionless protocol.
  - Minimal overhead, suitable for real-time applications.
  - Congestion control- Causes and effects of network congestion.
- Congestion avoidance and control algorithms (e.g., AIMD - Additive Increase, Multiplicative Decrease.
- TCP congestion control mechanisms
- Types of Timers
- Timeout Timer Calculation.

7. Session, Presentation and Application Layer

- Remote Procedure Call
- Application layers Protocols (Mail server , DNS, HTTP, SMTP, POP3 and others)
- RSA and Diffie Hellman Algorithm
- Digital Signature
- Firewall