GUJARAT TECHNOLOGICAL UNIVERSITY

BE 5 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Computer Networks - 3150710

Chapter 1: Introduction to computer networks and Internet

Repeated Questions:

1. OSI Model and Layered Architecture:

- **Q.** Explain the OSI model in detail and compare it with the TCP/IP model. / Explain in detail ISO/OSI network model with neat sketch. / Draw and explain different layers of OSI Model. / Draw the layered architecture of OSI reference model and write at least two services provided by each layer of the model. / Why OSI reference model is known as the layer architecture? What are the functions of layers of OSI reference model? [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 7 Marks)**

2. Delay, Loss and Throughput (Theory and Numerical):

- **Q.** Enlist types of delay and define them all. / Illustrate various delays which are occurring in data packet transmission. / Define delay, loss, and throughput in the context of packet-switching networks. / Differentiate nodal processing delay, queuing delay, transmission delay and propagation delay. / Find transmission delay for transmission of 1500 bytes (12000 bits) using a transmission rate of 100 Mbps. [Diagram required – refer to the original question paper] **(SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**

3. Networking Devices and Topologies:

- **Q.** Write functions of: Repeater, Hub, Gateway, Bridge, Switch and Router. / Explain different networking devices. / Explain functionality of Repeater, HUB, Bridge, Switch, Router and Gateway. / What is the functionality of Router, Bridge and Gateway? **(SUMMER 2022, 4 Marks; WINTER 2023, 4 Marks; WINTER 2023, 3 Marks; WINTER 2025, 7 Marks)**
- **Q.** Define network topology. Explain star topology in detail. / Explain different network topologies in detail. / What is topology in computer network? Differentiate star topology from mesh topology. **(SUMMER 2023, 7 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 3 Marks)**

4. Switching:

- **Q.** Discuss the circuit switching versus packet switching approaches for moving data through a network of links and switches. / What is packet switching network? How does it differ from packet switching? **(WINTER 2022, 7 Marks; SUMMER 2025, 3 Marks)**

Other Important Questions:

1. Network Fundamentals (Theory):

- **Q.** What is computer network? Describe the various types of network. **(SUMMER 2023, 3 Marks)**
- **Q.** What is client-server architecture? List its applications on the Internet. **(SUMMER 2026, 3 Marks)**
- **Q.** What is protocol? How it is different than standard? **(WINTER 2023, 3 Marks)**
- **Q.** What is the difference between a host and an end system? List several different types of end systems. **(SUMMER 2022, 3 Marks)**
- **Q.** Explain IP Address, Physical Address and Port Number in Brief. **(SUMMER 2022, 4 Marks)**

2. Protocol Stacks and Layers (Theory):

- **Q.** Explain the functions of TCP/IP Protocol stack. **(SUMMER 2024, 7 Marks)**

- **Q.** Discuss the five layer internet protocol stack along with the functionalities of each layer in detail. **(WINTER 2022, 7 Marks)**
- **Q.** Which of the OSI layers handles each of the following: i) Dividing the message into segments. ii) Determining which route through the subnet to use. iii) Dividing the transmitted bit stream into frames. **(WINTER 2022, 3 Marks)**

3. Performance and Network Structure (Theory):

- **Q.** Discuss throughput in Computer Network. **(WINTER 2025, 3 Marks)**
- **Q.** Besides bandwidth and latency, what other parameter(s) is/are needed to give a good characterization of the quality of service offered by network used for (i) Online financial transaction traffic? (ii) Video streaming traffic? **(WINTER 2022, 4 Marks)**
- **Q.** Differentiate network edge and network core. **(SUMMER 2026, 4 Marks)**
- **Q.** What is store and forward packet switching? **(WINTER 2023, 3 Marks)**

Chapter 2: Application Layer

Repeated Questions:

1. HTTP and DNS:

- **Q.** Why HTTP server is stateless? / Justify the statement, "HTTP server is stateless". / Explain persistent and non-persistent HTTP. / List and Explain the methods of HTTP. / Explain the formats of HTTP request and HTTP response messages. / Differentiate its persistent and non-persistent types with request-response behavior of HTTP. / Compare Persistent and non Persistent HTTP. / Describe HTTP request and response message format in brief. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 3 Marks; WINTER 2025, 4 Marks)**
- **Q.** Describe roles and responsibilities of DNS. / Explain various services provided by DNS. / Explain the purpose of DNS and its role in translating domain names into IP addresses. / Explain the role of Domain Name Server (DNS) in Internet? / Explain the hierarchical DNS system. / How does recursive queries in DNS work? Explain message format of DNS. / Explain HTTP and DNS in detail. / What is DNS? How does DNS work? Explain the hierarchy of DNS servers. **(WINTER 2022, 3 Marks; WINTER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**

2. Email:

- **Q.** Illustrate the working of the SMTP protocol with a simple example. / Explain SMTP Protocol. / Write note on E-mail. **(SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**

3. Socket Programming:

- **Q.** Explain the following TCP socket system calls: socket(), bind(), listen(), accept(). / Define following socket function call 1) Connect 2) Bind 3) Listen 4) Send / Explain the following system calls: socket(), bind(), listen(), accept(), connect(), send(), recv()? **(SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Web and URL (Theory):

- **Q.** What is web? Explain its architecture. **(SUMMER 2023, 3 Marks)**
- **Q.** What is URL? What are its identifiers? Explain them. **(SUMMER 2023, 4 Marks)**

2. Application Protocols and Transport Services:

- **Q.** State the port number for the following application layer protocols. i) FTP ii) HTTP iii) SMTP iv) POP3. **(WINTER 2022, 4 Marks)**
- **Q.** For the below mentioned internet applications protocol, mention the underlying transport protocol (TCP or UDP). i) Telnet ii) FTP iii) HTTP. **(WINTER 2022, 3 Marks)**
- **Q.** Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP? Name one application that uses UDP and why? **(SUMMER 2022, 4 Marks)**

3. Email:

- **Q.** Explain IMAP Protocol for email communication. **(SUMMER 2025, 3 Marks)**

Chapter 3: Transport Layer

Repeated Questions:

1. TCP and UDP:

- **Q.** Compare TCP and UDP. / Explain User Datagram Protocol (UDP) in detail and discuss how it differs from Transmission Control Protocol (TCP). **(SUMMER 2023, 7 Marks; WINTER 2023, 4 Marks; WINTER 2025, 7 Marks)**
- **Q.** Describe TCP segment structure. / Explain the various fields of TCP header. What are the advantages and disadvantages of TCP. / What is the significance of the following flags in TCP segment? i) URG ii) SYN iii) FIN iv) PSH. / Explain TCP segment structure and justify the importance of its field values. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 4 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Discuss three-way handshaking process in TCP. / Describe the process of establishing a TCP connection using the three-way handshake. **(SUMMER 2025, 4 Marks OR; SUMMER 2026, 4 Marks OR)**

2. Multiplexing and Demultiplexing:

- **Q.** Discuss Multiplexing and Demultiplexing at Transport layer. / Explain the concept of multiplexing and demultiplexing by TCP in detail. / What is multiplexing and demultiplexing in transport layer? / Explain in brief socket, multiplexing and demultiplexing. **(SUMMER 2022, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks OR)**

3. Flow Control, Error Control and Congestion Control:

- **Q.** Explain how TCP handles flow control and congestion control. / Describe flow control and error control in TCP. / How end-to-end congestion control is provided by TCP. / Explain flow and error control in TCP. / What is congestion control? How does it differ from flow control? / Differentiate Congestion Control, Flow control and Error Control. / Give difference between flow control verses Congestion Control. **(SUMMER 2022, 3 Marks; WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 7 Marks)**

Other Important Questions:

1. TCP (Theory):

- **Q.** How TCP estimates RTT (Round Trip Time)? **(SUMMER 2026, 4 Marks)**
- **Q.** How does congestion impact network performance, and what metrics are used to detect congestion? **(SUMMER 2025, 4 Marks)**

2. UDP (Theory):

- **Q.** Explain the UDP checksum mechanism for error detection with example. **(WINTER 2022, 3 Marks)**
- **Q.** Explain the various fields of UDP header. What are the advantages and disadvantages of UDP over TCP? **(SUMMER 2025, 7 Marks OR)**
- **Q.** Discuss the applications of UDP. **(SUMMER 2026, 4 Marks)**

3. Transport Layer Concepts (Theory):

- **Q.** What is socket? Explain its importance at transport layer protocols. **(SUMMER 2023, 4 Marks)**
- **Q.** Explain the wavelength division multiplexing in detail. **(SUMMER 2023, 4 Marks OR)**
- **Q.** What are the functions of transport layer in OSI reference model? How segmentation and reassemble is performed in transport layer? **(SUMMER 2024, 4 Marks)**
- **Q.** Differentiate between connection oriented and connection less service. / Give difference between connection oriented and connection less services. / What is connection-less service?

How does packet delivery connection-less services does differ from connection-oriented services? **(SUMMER 2022, 3 Marks OR; WINTER 2023, 4 Marks; SUMMER 2025, 3 Marks OR)**

- **Q.** What is port address in transport layer? How does it help in Process-to-process delivery at transport layer? **(SUMMER 2025, 3 Marks)**

4. Reliable Data Transfer:

- **Q.** Explain RDT 2.0. **(SUMMER 2022, 7 Marks OR)**

Chapter 4: Network Layer

Repeated Questions:

1. Routing Algorithms:

- **Q.** Describe Distance Vector Routing Algorithm. / Explain distance vector routing with suitable example. / Explain distance vector routing protocol. / How the vector of distance for each router is built in distance vector routing protocol? What is count-to-infinity problem in it? **(SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks)**
- **Q.** Explain Link State Routing algorithm in detail. / Explain link state routing protocol. / Explain Link state routing with suitable example. / How routing table is built in link state routing protocol? Explain the steps in detail with figure and example. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2025, 7 Marks)**
- **Q.** What is count to infinity problem? / Explain the problem of Count-to-infinity with example. / Discuss the count-to-infinity problem in distance vector routing algorithm with example. **(WINTER 2022, 4 Marks; SUMMER 2023, 3 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 3 Marks)**

2. Network Service Models:

- **Q.** Compare virtual circuit and datagram. / Explain datagram networks and virtual circuit networks. / Enlist advantages of virtual circuit over datagram. / Compare Datagram and virtual circuit. **(SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks OR; WINTER 2025, 4 Marks)**

3. IP Addressing and Subnetting (Theory and Numerical):

- **Q.** What is IP address? Explain different classes of IP address. / Explain the class-full sub-netting with example. / What is subnet? What are the benefits of creating subnets? / Differentiate classful and classless addressing in IPv4. / Find the subnet mask value to create the following number of subnet in class A? a) 2 b) 5 c) 16 d) 63 / What is the use of class D and Class E in IPv4 addressing? / How many maximum number of hosts can be connected in a single class B and C network? / What is subnetting? What are the subnet masks values for creating 4 and 8 subnets in class C network? **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 3 Marks; SUMMER 2024, 4 Marks; SUMMER 2024, 4 Marks OR; SUMMER 2025, 3 Marks; SUMMER 2025, 4 Marks OR)**

4. Unicast, Multicast and Broadcast:

- **Q.** Define the term: Unicast, Multicast and Broadcast. / Define Unicast, multicast and broadcast. / Define the term unicasting, multicasting, and broadcasting. / Differentiate multicasting and broadcasting. **(WINTER 2022, 3 Marks OR; SUMMER 2024, 3 Marks OR; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks OR)**
- **Q.** Write a short note on broadcast and multicast routing. **(SUMMER 2023, 4 Marks; SUMMER 2026, 7 Marks OR)**

5. ARP and NAT:

- **Q.** Write functionalities of ARP. / Discuss NAT (Network Address Translation) as solution to IP address depletion problem. / What is the purpose of Address Resolution Protocol (ARP) and Network Address Translation (NAT)? **(WINTER 2022, 3 Marks; WINTER 2025, 4 Marks; WINTER 2025, 4 Marks OR)**

Other Important Questions:

1. IPv4, IPv6 and Fragmentation:

- **Q.** Compare IPv4 and IPv6. **(WINTER 2023, 4 Marks; WINTER 2025, 3 Marks)**

- **Q.** Explain IPv4 datagram format and importance of each field. **(SUMMER 2022, 7 Marks OR)**
- **Q.** What is the relevance of Type of Service (ToS) and Time to Live (TTL) field in IPv4 packet? **(WINTER 2022, 4 Marks)**
- **Q.** What is fragmentation in IP? Explain briefly. **(SUMMER 2026, 3 Marks)**
- **Q.** Write a short note on IP addressing and forwarding. **(SUMMER 2026, 7 Marks)**
- **Q.** How DHCP protocol works? **(SUMMER 2022, 4 Marks)**

2. Routing Concepts:

- **Q.** Describe Hierarchical Routing. **(SUMMER 2026, 3 Marks)**
- **Q.** What is hop count? Explain its role in routing. **(SUMMER 2026, 3 Marks OR)**
- **Q.** RIP is Intra-AS Routing protocol in the Internet. True or False? Justify your answer. **(SUMMER 2026, 3 Marks)**
- **Q.** Explain the shortest path routing algorithm. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Explain Route Summarization or Route Aggregation in network layer. **(WINTER 2022, 4 Marks OR)**
- **Q.** Discuss optimality principle with example. **(WINTER 2023, 4 Marks OR)**
- **Q.** Why are different inter-AS and intra-AS protocols used in the Internet? **(SUMMER 2022, 4 Marks OR)**

3. Routers and Switching Fabrics:

- **Q.** Describe the internal hardware structure of a router. **(SUMMER 2026, 3 Marks OR)**
- **Q.** List and briefly describe three types of switching fabrics used in Routers. Which, if any, can send multiple packets across the fabric in parallel? **(SUMMER 2022, 4 Marks)**

4. Network Layer Services and Congestion:

- **Q.** In Datagram Networks, packets sent from one end system to another may follow different paths through the network and may arrive out of order. True or False? Justify your answer. **(SUMMER 2026, 3 Marks OR)**
- **Q.** What are the three most important network-layer functions in a virtual-circuit network? **(WINTER 2022, 3 Marks OR)**
- **Q.** What are the services provided to transport layer by the network layer? **(WINTER 2023, 4 Marks)**
- **Q.** Explain leaky bucket protocol for congestion control. **(SUMMER 2024, 4 Marks OR)**

Chapter 5: The Link layer and Local area networks

Repeated Questions:

1. Error Detection and CRC (Theory and Numerical):

- **Q.** Describe CRC for error detection. / Explain Parity Checks and CRC with simple examples. / Demonstrate the various error detection techniques at data link layer with example. / Generate CRC code for message 1101010101. Given generator polynomial is $x^4 + x^2 + 1$. / Consider the 7-bit generator, G=10011, and suppose that D has the value 1010101010. What is the value of R? / A bit stream 10011101 is transmitted using standard CRC Method. The divisor is 1001. Show the CRC codeword is generated at sender side. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2025, 4 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**

2. Flow Control and Sliding Window Protocols:

- **Q.** What is flow control? How does stop-n-wait protocol perform flow control? **(SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks)**
- **Q.** Describe Go back n and selective repeat protocol. / Explain Go-back N protocol? What is the limitation of it? How selective repeat protocol does overcome the limitation of Go back N protocol? / Describe Go Back N and Selective Repeat protocol. / Explain selective repeat protocol with the concept of sliding window. **(SUMMER 2022, 7 Marks; SUMMER 2024, 7 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** What is piggybacking? Explain the advantage of it. / Explain the term piggybacking and congestion. / What is piggybacking in flow control? **(SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2025, 3 Marks OR)**

3. Multiple Access Protocols:

- **Q.** Discuss slotted Aloha. / How does pure ALOHA and slotted ALOHA protocol work? / Discuss the working of slotted aloha along with its efficiency in terms of channel utilization. / What do you mean by random access protocols? Explain slotted ALOHA in brief. / What is Slotted ALOHA? How it differs from Pure ALOHA? **(SUMMER 2022, 4 Marks OR; WINTER 2022, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 3 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** Describe CSMA protocol with Collision Detection. / Explain CSMA/CD protocol. / Explain p-persistent CSMA protocol in detail. / Explain different types of CSMA with suitable example. **(SUMMER 2022, 3 Marks OR; WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**

4. Bit Rate and Baud Rate:

- **Q.** Define: bit rate and baud rate. / State the difference between bit rate and baud rate. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 4 Marks OR; WINTER 2025, 3 Marks)**

Other Important Questions:

1. Error Detection and Framing (Theory):

- **Q.** Define error detection and correction. **(SUMMER 2023, 3 Marks)**
- **Q.** Discuss parity check for error detection in data transfer. **(SUMMER 2022, 3 Marks)**
- **Q.** What is the use of two dimensional parity in error detection? / How does two dimension parity check works for detecting error in data link layer? **(SUMMER 2023, 3 Marks OR; SUMMER 2024, 4 Marks OR)**
- **Q.** What is the minimum Hamming distance? **(SUMMER 2023, 3 Marks)**
- **Q.** Explain LRC with suitable example. **(WINTER 2023, 3 Marks)**
- **Q.** Data link protocols almost always put CRC in a trailer rather than in a header. Why? **(WINTER 2022, 3 Marks OR)**
- **Q.** Explain bit stuffing method with example. **(SUMMER 2024, 3 Marks)**

- **Q.** Differentiate fix size and variable size framing. **(SUMMER 2025, 3 Marks)**

2. Data Link Layer and MAC Sub Layer (Theory):

- **Q.** Describe and discuss the data link layer design issues. **(SUMMER 2023, 7 Marks OR)**
- **Q.** What is medium access control sub layer? **(SUMMER 2023, 4 Marks)**
- **Q.** Discuss the MAC sub layer Design issues? **(SUMMER 2023, 3 Marks OR)**
- **Q.** Define following types of assumptions in MAC sub layer. a) Single channel b) N Stations c) Collision **(SUMMER 2024, 3 Marks OR)**
- **Q.** Explain the following static channel allocations mechanisms: i) TDMA ii) FDMA **(WINTER 2022, 4 Marks)**
- **Q.** Discuss taking turn protocol. **(WINTER 2025, 3 Marks)**
- **Q.** What is collision? How collision can be avoided using bit-map protocol? Explain with example. [Diagram required – refer to the original question paper] **(SUMMER 2025, 7 Marks OR)**

3. LANs and Addressing (Theory):

- **Q.** Write note on: 802.3 Ethernet. **(WINTER 2023, 7 Marks OR)**
- **Q.** What is VLAN? Explain its advantages and working. **(SUMMER 2026, 4 Marks OR)**
- **Q.** How physical addresses are different from logical addresses? **(SUMMER 2025, 3 Marks OR)**

Uncategorised Questions

Repeated Questions:

None identified.

Other Important Questions:

1. Network Security:

- **Q.** Describe how a botnet can be created, and how it can be used for a DDoS attack. **(SUMMER 2022, 3 Marks OR)**

****