## 1.1

1. Please list five key components of a digital communication system.

*Message, sender, receiver, link, protocols*

1. Please mark the incorrect statements.
* Delayis the time to send a message from sender to the receiver.
* *The main purpose of a modem is to detect and correct bit error.*
* Channel capacity is the maximum number of bits a link can carry per second.
1. Please complete the following sentences:

*Multiplexing* the mechanism of combining transmissions from multiple sources. *Demultiplexing* is the process of separating multiple transmission from a combined signal.

## 1.2

1. Please complete the following sentence:

A router is a *network* layer device.

1. A fully connected mesh network with n nodes consists of n/2 links. Chose the correct answer:
* True
* *False*
1. Which type of delay is the most difficult to estimate?

*Queuing delay*

## 1.3

1. Please complete the following sentence:

Polar NRZ represents *1* as positive pulse where 0 is represented by a *negative* pulse.

1. Is this statement true or false? The Nyquist theorem indicates how frequently an analog signal should be sampled to convert it into digital signal.
* *True*
* False
1. Which theorem is used to calculate channel capacity?

*Shannon-Hartley*

## 1.4

1. Please complete the following sentence:

A system that supports simultaneous bidirectional data transfer at a time is called *full-duplex*.

1. Is the following statement true or false? Optical fiber cable is an example of unguided physical layer medium.
* True
* *False*
1. AGWN follows what type of distribution?

*Gaussian*

## 2.1

1. Please list the seven layers of the OSI model.

*Application, presentation, session, transport, network, datalink, and physical*

1. Please mark the correct statements.
* Network layer convers logical bits to physical bits.
* Main purpose of session layer is to flow control.
* *Transport layer provides reliable data transfer services.*
1. Please complete the following sentence:

Routers have only *three* layers - *network*, *datalink*, and physical layers.

## 2.2

1. What multiple access protocols are used for ethernet and Wi-Fi LAN?

*CSMA/CD, CSMA/CA.*

1. Which of the following service is not provided by data link layer?
* Flow control.
* *Routing.*
* Error detection.
1. Please complete the following sentence:

The data link layer address is called *MAC* address. It is a *48-bit* or *6-byte* hardware address.

## 2.3

1. What are the two versions of IP addressing?

*IPv4, IPv6.*

1. Which of the following service is not the primary concern of network layer?
* Packet forwarding.
* Routing.
* *Flow control.*
1. Please complete the following sentence:

In a *link state* routing algorithm, all routers share routing information with each other by *broadcasting*.

## 2.4

1. What are the two most popular transport layer protocol?

*TCP, UDP.*

1. Which of the following service is not provided by transport layer?
* Flow control.
* Congestion control.
* *Packet switching and Routing.*
1. Please complete the following sentence:

UDP is a *connectionless* transport layer protocol and does not guarantee *reliable* data transfer services.

## 3.1

1. What key components of WWW were invented by CERN?

*HTML, HTTP, browser, server*

1. IANA maintains IP address allocation, domain name systems, media types etc. Chose the correct answer:
* True
* *False*
1. Please complete the following sentence:

In a *packet* switching network there is no *dedicated* path between sender and receiver. Packets from a same source can take *different* paths to reach to the destination.

## 3.2

1. Please complete the following sentence:

Unlike OSI model, TCP/IP does not include *presentation* and *session* layers.

1. Is the following statement true or false? The application layer is available only on end nodes, it is absent on the connecting nodes, such as router, switch, bridge, and hub.
* *True*
* False
1. What is the transport layer protocol name for multimedia transmission?

*SCTP (Stream Control Transmission Protocol)*

## 3.3

1. Please complete the following sentence:

Though RTP and SCTP are *transport* layer protocols the *datagrams* of these protocols are encapsulated by *UDP* header bits.

1. Is the following statement true or false? The transport layer provides few supplementary protocols, including dynamic host configuration protocol (DHCP), internet control message protocol (ICMP), internet group management protocol (IGMP), and address resolution protocol (ARP).
* True
* *False*
1. Which link layer protocol is used to retrieve MAC address from known IP address?

*RARP*

## 3.4

1. Please complete the following sentence:

TLS is basically the updated version of *SSL* and located between *application* and *transport* layers.

1. Is the following statement true or false? IPsec protocol is used for both TCP and UDP protocols.
* *True*
* False
1. For a known h(m), it should be computationally infeasible to produce a message m’ for which h(m) = h(m’). What is this property is known as?

*Second preimage resistance*

## 4.1

1. Write down the names of two most widely used distributed architectures for computer networking.

*Client-Server architecture.*

*P2P architecture.*

1. Please mark the correct statements.
* *Server and clients are identified by a pair of identifiers*.
* Server is identified by port number.
* Client is identified by IP address.
1. Please complete the following sentence:

In case of a connectionless service the *connection request* and *connection accept* operations are absent.

## 4.2

1. Please complete the following sentence:

The microservice architecture develops software application as a *collection* of *small independent services* where each service executes its own *independent* process.

2. Webservice is not developed on the which open standard ...

* UDDI
* *IMAP*
* WSDL
* XML

3. Service oriented architecture (SOA) is an enhanced and complex extension of client-server architecture.

* *True*
* False

## 4.3

1. Cloudlet is a small-scale cloud data center deployed in between mobile end device and cloud at the core.
* *True*
* False
1. Which of the following is not a characteristic of edge computing?
* Low latency
* Location awareness
* Mobility support
* *Homogeneity*
1. Please complete the following sentence:

The main idea of cloud computing is to provide *on-demand* IT resources over *internet*.

4.4

1. Please list three distributed architectures of Internet.

*Client-server.*

*Peer-to-peer.*

*Hybrid.*

1. Please mark the correct statements.
* *If number of peers increases the P2P model performs better than client-server model*.
* VoIP services mostly use client-server architecture.
* Tracker primarily monitors the unchoked users.
1. Please complete the following sentence:

In a *P2P* architecture, there is no dedicated server, and no node or peer is always *active*.

## 5.1

1. What are the two ways of event synchronization in a distributed system?

*Physical clock synchronization.*

*Logical clock synchronization.*

1. Please mark the correct statements.
* *The goal of marshalling is to represent data in a neutralized format*.
* Reference broadcast synchronization algorithm must include UTC support.
* RPC does not support P2P distribution system.
1. Please complete the following sentence:

Middleware resides between *operating* system and software applications.

## 5.2

1. Please list three names of distributed algorithms.

*Centralized.*

*Decentralized.*

*Distributed.*

1. Please mark the correct statements.
* *Centralized algorithm suffers from single point failure*.
* Centralized algorithm suffers from multiple point failure.
* Decentralized problem suffers from single point failure.

Please complete the following sentence:

The key to a distributed system is *concurrency* and *collaboration* among multiple processes running on various machines.

## 5.3

1. Please complete the following sentence:

There are three criteria to characterize inconsistency—deviation in *numerical* values, *staleness*, and *ordering* of update information between replicas.

1. Which of the following is not an example of client-centric consistency?
* Monotonic read consistency
* Monotonic write consistency
* Read your writes consistency
* *Read follows read consistency*
1. A distributed transaction maintains the following properties: location transparency, replication transparency, concurrency transparency, and failure transparency.
* *True*
* False

## 5.4

1. What are the three terms referred by CIA-triad?

*Confidentiality.*

*Integrity.*

*Availability.*

1. Please mark the correct statements.
* *Asymmetric key encryption is used to share the symmetric key*.
* Symmetric key encryption is used to share the asymmetric key.
* Digital signature can ensure data confidentiality.
1. Please complete the following sentence:

Nowadays, a *distributed* system not only transfers data but also *source* codes.

## 6.1

1. What are the two types of distributed ledger?

*Public ledger.*

*Private ledger.*

1. Please mark the correct statements.
* *Consensus layer deals with distributed consensus in order to ensure the trustworthiness of a block*.
* Ethereum like Bitcoin it is also based on private DLT, and primary application is cryptocurrency.
* Bitcoin is a DLT system that is built on client-server architecture.
1. *Immutability* means the actions and transactions on a device can be traced and audited by a ledger.

## 6.2

1. Please name three mobile computing routing algorithms.

*Ad hoc on-demand distance vector (AODV).*

*Dynamic source routing (DSR).*

*Optimized link state routing protocol (OLSR).*

1. Please mark the correct statements.
* *OLSR is suitable for a large scale mobile ad hoc network with high node density*.
* OLSR avoids the problems of classical link state routing protocols.
* DSR was designed for a network with up to 2000 mobile nodes.

3. Please complete the following sentence:

*IP* of a mobile node is always identified by its *home* IP address, even if it moves to a new geographical location.

## 6.3

1. Please complete the following sentence:

CoAP is a *web* transfer protocol designed for a wireless network with *constrained* nodes i.e., low power, low memory, low data transfer rate etc.

1. Which of the following is not a property of pervasive computing?
* Context aware
* Distributed
* Autonomous
* *Centralized*
1. LoRa provides short range communication using low power network nodes.
* True
* *False*