



UCSC

University of Colombo, Sri Lanka

University of Colombo School of Computing



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY
(EXTERNAL)**

Academic Year 2025— 2nd Year Examination — Semester 4

IT4506 — Computer Networks

Part 1 - Multiple Choice Question Paper

(2 Hours for both Part 1 and Part 2)

Important Instructions

- This paper has **two (2) parts, Part 1 and Part 2**.
- The total duration of **both Part 1 and Part 2 is 2 hours**.
- The final mark for the paper will be determined by averaging the scores of Part 1 and Part 2, each of which is graded out of **100**.
- The medium of instructions and questions is English.
- This paper (Part 1) has **25 MCQ questions** on **8 pages**. Answer **all** questions.
- Each question will have **5 (five)** choices with **ONLY ONE** correct answer.
- Answers should be marked on the **special answer sheet** provided.
- Note that questions appear on both sides of the paper. If a page or part of a page is not printed, please inform the supervisor/invigilator immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**
- Any electronic device capable of storing and retrieving text, including electronic dictionaries, smartwatches, and mobile phones, is **not** allowed.
- Calculators are **not allowed**.
- *All Rights Reserved*. This question paper can NOT be used without proper permission from the University of Colombo School of Computing.

1). What is the primary purpose of the preamble within a Data Link Layer frame?

- (a) To delimit the boundaries by indicating the exact beginning of a frame.
- (b) To specify the total length and payload size of the incoming frame.
- (c) To serve as the cyclic redundancy check (CRC) for frame verification.
- (d) To signal to the receiving node that a frame contains invalid or corrupt data.
- (e) To detect and automatically correct single-bit transmission errors.

2). Within the context of the OSI reference model, which layer is responsible for forwarding the data frame between two directly connected physical nodes?

- | | | |
|-----------------------|--------------------|---------------------|
| (a) Application Layer | (b) Internet Layer | (c) Transport Layer |
| (d) Data Link Layer | (e) Session Layer | |

3). Which of the following wireless protocol is primarily engineered for short-range communication within a Wireless Personal Area Network (WPAN) topology?

- (a) IEEE 802.11ac
- (b) GSM
- (c) Bluetooth (IEEE 802.15.1)
- (d) IEEE 802.11b
- (e) IEEE 802.11a

4). Which of the following statements most accurately defines the primary operational purpose of a **Flow Control** mechanism within a communication network?

- (a) It dynamically manages global internet routing topologies to prevent packet loss across core internet service provider (ISP) backbones.
- (b) It prevents a fast transmitting sender from overwhelming the physical buffer capacity of a slow receiving host.
- (c) It is an administrative technique used exclusively to throttle user bandwidth when a monthly data cap is exceeded.
- (d) It calculates the cryptographic verification path required to authenticate data frames at the physical layer.
- (e) It maximises total end-to-end latency to ensure packets arrive in a randomised, scrambled sequence.

5). In computer networking, which of the following scenarios best describes the underlying cause and scope of network **Congestion**?

- (a) A localised software mismatch where a receiver's internal CPU is temporarily placed into an idle power-saving state.
- (b) A physical layer hardware failure where a single twisted-pair copper cable experiences total signal attenuation.
- (c) A condition that occurs within the network core when the aggregate traffic load from multiple sources exceeds the capacity of intermediate switches, routers, or links.
- (d) An intentional administrative security lockdown triggered whenever an unauthorised MAC address attempts a handshake.
- (e) The deliberate process of dividing an enterprise network into multiple non-overlapping virtual local area networks (VLANs).

6). Which of the following statements regarding the characteristics and deployment of a Metropolitan Area Network (MAN) is **correct**?

- (a) A MAN is strictly limited to a maximum physical coverage area of 100 meters, typically utilizing twisted-pair copper cabling.
- (b) A MAN spans a geographic area larger than a LAN but smaller than a WAN, typically interconnecting multiple sites across a town or city.
- (c) MAN architectures are explicitly designed to operate without any underlying physical infrastructure, relying solely on satellite-based transport.
- (d) A MAN is universally owned, managed, and financially maintained by a single private residential user.
- (e) The underlying protocols of a modern MAN are completely incompatible with standard Ethernet framing structures.

7). When a client host requests a dynamic network configuration from a DHCP server, which of the following parameters is **NOT** dynamically assigned or provided by the server?

- (a) Subnet Mask
- (b) Default Gateway IP Address
- (c) Media Access Control (MAC) Address
- (d) Domain Name System (DNS) Server IP Address
- (e) Lease Time Duration

8). In the context of digital computer networks, which of the following statements provides the most accurate definition of “bandwidth”?

- (a) The physical distance in meters that a data signal can travel through a copper or fiber-optic medium before experiencing total attenuation.
- (b) The minimum round-trip time (RTT) required for a single data packet to travel from a source host to a destination host and back.
- (c) The maximum theoretical capacity or data transmission rate of a communication channel, typically measured in bits per second (bps).
- (d) The total amount of electrical power, measured in Watts, consumed by intermediate networking hardware during active packet routing.
- (e) The processing speed of a network interface card’s (NIC) onboard CPU when handling concurrent cryptographic handshakes.

9). What is the primary operational purpose of a **modem** within a computer network architecture?

- (a) To dynamically assign private IPv4 addresses to local hosts using the Dynamic Host Configuration Protocol (DHCP).
- (b) To convert digital binary data from a local computing device into analog signals for transmission over an analogue medium (channel), and vice versa.
- (c) To inspect incoming network layer packets and block unauthorised traffic based on a predefined set of security rules.
- (d) To forward data frames between completely isolated local area networks (LANs) by maintaining a centralised MAC address table.
- (e) To amplify the physical wireless radio frequency signals across a campus to extend the effective range of a local Wi-Fi network.

10). In the context of error-detection and error-correction coding, how is the Hamming distance between two binary codewords of equal length defined?

- (a) The total number of bit positions in which the corresponding bits of the two codewords differ.
- (b) The absolute mathematical difference between the decimal representations of the two binary sequences.
- (c) The total number of consecutive logic-one bits present in the longer of the two codewords.
- (d) The sum of all bit inversions required to convert a given codeword back into its original analog waveform.
- (e) The ratio of corrupted bits to the total payload length transmitted across a noisy channel.

- 11). Which of the following terms describes a physical or logical communication channel that permits data transmission to occur in both directions between the receivers simultaneously across the same medium?

(a) Full-duplex	(b) Half-duplex	(c) Simplex
(d) Multiplex	(e) Demultiplex	

- 12). In a random access network utilising the Pure ALOHA protocol, let T represent the time required to transmit a single data frame of fixed size. What is the total length of the vulnerable period during which a collision with another frame can occur?

(a) $T/2$	(b) T	(c) $1.5T$
(d) $2T$	(e) $3T$	

- 13). What is the primary operational purpose of the 8-byte Preamble field appended to the beginning of an IEEE 802.3 Ethernet frame?

- | |
|---|
| <ul style="list-style-type: none">(a) To contain the 48-bit physical MAC addresses of both the immediate source and next-hop destination nodes.(b) To act as a cryptographic handshake token that validates the security clearance of the transmitting host.(c) To serve as a buffer space that is intentionally discarded by intermediate routers to enforce uniform quality of service (QoS) throttling.(d) To provide a unique pattern of alternating bits that allows the receiving network interface card (NIC) to synchronise its clock with the incoming bit stream.(e) To hold the cyclic redundancy check (CRC) bits needed to determine if the frame payload experienced bit errors during transit. |
|---|

- 14). Which of the following optical characteristics represents the feature of Single-Mode Fiber optic cabling?

- | |
|--|
| <ul style="list-style-type: none">(a) The core uses an unclad copper filament that converts incoming optical waves into alternating electrical current before it reaches the receiver.(b) Signals experience extremely high attenuation over short distances, making it suitable exclusively for intra-room deployments under 10 meters.(c) It relies on a significantly larger core diameter than multi-mode fiber, allowing low-cost Light Emitting Diodes (LEDs) to serve as its primary light source.(d) Light is intentionally refracted at multiple extreme angles simultaneously to allow dozens of different data streams to travel through the exact same physical core path.(e) Light signals propagate along a single axial path, traveling down the center of the core without continuously bouncing off the cladding walls. |
|--|

15). Which of the following routing protocols is classified as an Exterior Gateway Protocol (EGP) and is globally utilised for **interdomain routing** on the Internet?

- (a) Routing Information Protocol
- (b) Open Shortest Path First
- (c) Enhanced Interior Gateway Routing Protocol
- (d) Border Gateway Protocol
- (e) Intermediate System to Intermediate System

16). In transport-layer network programming, which primitive function is natively executed by a server application to block execution and await the arrival of an incoming data packet or connection request?

- | | | |
|----------------|-------------|-------------|
| (a) SEND | (b) CONNECT | (c) RECEIVE |
| (d) DISCONNECT | (e) BIND | |

17). Which of the following Transport Layer protocols is the most widely deployed connection-oriented standard used over an IP network?

- (a) User Datagram Protocol (UDP)
- (b) Transmission Control Protocol (TCP)
- (c) Internet Control Message Protocol (ICMP)
- (d) Address Resolution Protocol (ARP)
- (e) Hypertext Transfer Protocol (HTTP)

18). Which of the following Application Layer protocols is architecturally designed as a simple, text-based (ASCII) protocol where commands and responses are transmitted in human-readable plain text?

- (a) Simple Mail Transfer Protocol (SMTP)
- (b) Domain Name System (DNS)
- (c) Simple Network Management Protocol (SNMP)
- (d) Dynamic Host Configuration Protocol (DHCP)
- (e) Secure Shell (SSH)

19). In network security architecture, what term is used to describe the isolated physical or logical subnetwork that exposes an organisation's external-facing services to an untrusted network, such as the Internet, while protecting the internal local area network (LAN)?

- (a) Intranet Zone
- (b) Demilitarised Zone (DMZ)
- (c) Core Layer
- (d) Air-Gapped Network
- (e) Loopback Interface

20). Within modern network device architecture, which functional plane is directly responsible for per-packet operations, including packet buffering, queue scheduling, packet header modification, and hardware-level forwarding?

- (a) Control Plane
- (b) Management Plane
- (c) Data Plane
- (d) Application Plane
- (e) Orchestration Plane

Answer questions **21 to 25** using the following information.

A machine, M_0 , in a network (L) uses the IP address 192.248.17.8/26.

21). What is the subnet mask used in this network in dotted decimal notation?

- | | | |
|---------------------|---------------------|-------------------|
| (a) 255.255.255.128 | (b) 255.255.255.192 | (c) 255.255.255.0 |
| (d) 1.255.255.255 | (e) 255.255.255.8 | |

22). What is the maximum number of physical machines that can be connected to L ?

- | | | |
|--------|---------|---------|
| (a) 62 | (b) 255 | (c) 127 |
| (d) 24 | (e) 253 | |

23). What is the broadcast address of the network L ?

- | | | |
|-------------------|--------------------|-------------|
| (a) 192.248.17.63 | (b) 255.255.255.0 | (c) 0.0.0.0 |
| (d) 1.1.1.1 | (e) 192.248.17.254 | |

- 24).** Assume that the network L is divided into 2 equal size sub networks, $L1$ and $L2$. A machine, M_1 , with the IP address 192.248.17.40 is in $L2$. Which of the following is the correct representation of the IP address of the M_1 in CIDR format?

- | | | |
|----------------------|----------------------|----------------------|
| (a) 192.248.17.40/2 | (b) 192.248.17.40/27 | (c) 192.248.17.40/26 |
| (d) 192.248.17.40/25 | (e) 192.248.17.40/13 | |

- 25).** Assume that the network L is divided into 4 equal size sub networks. Which one of the following is a broadcast address of one of those sub networks?

- | | | |
|---------------------|--------------------|--------------------|
| (a) 192.248.17.0 | (b) 192.248.17.31 | (c) 192.248.17.255 |
| (d) 255.255.255.255 | (e) 192.248.17.128 | |

_____ ***** _____