

Computer Networks (CS3001)

Sessional-I Exam

Course Instructor(s):

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Section(s): CS(A-D)

Total Time (Hrs): 1

Total Marks: 50

Total Questions: 3

Date: Feb.25. 2025

Roll No

Course Section

Student Signature

Do not write below this line.

Attempt all the questions.

Q1: MCQs: Fill the following table by choosing the correct options from given MCQs. [20 marks]

1 ✓ b	2 ✓ c	3 ✓ b	4 ✓ c
5 ✗ b	6 ✓ c	7 ✓ b	8 ✓ c
9 ✓ b	10 ✓ a	11 ✗ a	12 ✓ a
13 ✓ d	14 ✓ b	15 ✓ c	16 ✓ a
17 ✓ d	18 ✗ c	19 ✓ b	20 ✓ b

1. In which of the following scenarios does the PDU transition from a Frame to a Packet?
- When data moves from the Network layer to the Transport layer
 - When data moves from the Data Link layer to the Network layer
 - When data moves from the Transport layer to the Application layer
 - When data moves from the Application layer to the Transport layer
2. If the length of a Packet is 300 bits and the transmission rate is $R = 50$ bits/sec, then what will be the one-hop transmission delay?
- 15 seconds
 - 0.5 seconds
 - 6 seconds
 - 2 milliseconds
3. In a network having bandwidth of 250 Mbps, if a 64bit packet only being transmitted and there was no earlier transmission, then what will be the queuing delay.
- 3.2 microseconds
 - 0 second
 - 32 seconds
 - 1 microseconds
4. Which of the following uses UDP at the transport layer?
- HTTP
 - FTP
 - DNS
 - POP3
5. The minimum size of the packet header in OSI model is _____.
- 15 bits
 - 10 bits
 - 20 bits
 - none of these (a,b,c)
6. In an access network, which of the following factors primarily affects Quality of Service (QoS)?
- Router CPU speed
 - Fiber-optic backbone speed
 - Latency and packet loss
 - Number of BGP routes

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7. Which email protocol downloads messages to the local device and deletes them from the server?
a. IMAP b. POP3 c. SMTP d. FTP
8. Which command can be used in Linux to manually query DNS records?
a. ping b. netstat c. nslookup d. ipconfig
9. A user is unable to receive new emails but can send emails. Which protocol might be misconfigured?
a. SMTP b. IMAP c. HTTP d. FTP
10. What is the role of a "seeder" in a P2P file-sharing system?
a. A peer that has the complete file and shares it with others
b. A peer that only downloads but does not upload
c. A server that manages peer connections
d. A peer that acts as a firewall for other users
11. A file of size 2 GB needs to be distributed to 10 peers using a client-server approach. The server's upload speed is 20 Mbps, and the slowest client download speed is 10 Mbps. What is the minimum time required to distribute the file?
a. 800 seconds b. 1,600 seconds
b. 1,200 seconds d. 400 seconds
12. Packet-switched networks are more efficient than circuit-switched networks because:
a. They allocate bandwidth dynamically
b. They require a fixed path for communication
c. They use more bandwidth per connection
d. They do not use routers
13. Which of the following is NOT a valid IP address?
a. 192.168.1.200
b. 56.100.50.255
c. 10.0.0.5
d. 172.16.257.1
14. What is the function of an MX record in DNS?
a. Mapping IP addresses to domain names
b. Specifying mail servers for a domain
c. Redirecting domains to other servers
d. Handling DNS cache

15. Which protocol is used by email clients to retrieve emails from a mail server while keeping them stored on the server?

- a. SMTP b. POP3 c. IMAP d. SNMP

16. A web page consists of multiple objects, including text, images, and scripts. Each object is typically retrieved using:

- a. A single HTTP request b. Multiple HTTP requests
c. A DNS request d. An ARP request

17. If a webpage contains 5 images, a CSS file, and a JavaScript file, how many separate HTTP requests are required in a non-persistent HTTP connection?

- a. 1 b. 5 c. 3 d. 8

18. What does an HTTP request typically contain?

- a. IP address, MAC address, and Port number b. URL, HTTP method, and Headers
c. Only the requested object d. Routing table

19. What is an advantage of using persistent HTTP connections?

- a. Each request requires a new TCP connection
b. It reduces the latency caused by multiple TCP handshakes
c. It increases the number of required TCP connections
d. It only works for static web pages

20. Which type of switching is predominantly used in the core network for high-speed data forwarding?

- a. Circuit Switching b. Packet Switching
c. Message Switching d. Time-Division Multiplexing (TDM)

[10 Marks]

Question 2

Consider that you are working in a research facility, using one of the lab computers connected to an internal LAN network. This network has a **350 Mb/s transmission rate** to **Router 1**, which manages internal traffic and connects to the facility's main network, providing access to the Internet. Now, let's analyze the situation:

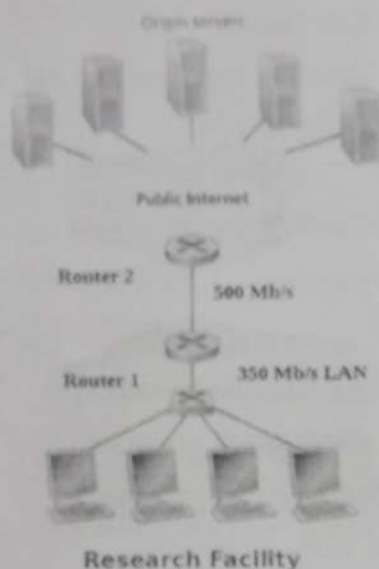
- The average size of a requested data file is **850,000 bits**.
- The lab systems collectively generate **40 requests per second** to external servers.
- Once a request reaches **Router 2** (the facility's gateway to the Internet), it takes an average of **1.5 seconds** to retrieve the requested data.

The total average response time is determined by adding the **access delay (Router 2 to Router 1)** and the **Internet delay**.

(a) Calculate the total average response time. [4]

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- (b) Now assume that a **web cache** is deployed within the research facility's LAN to optimize response times. Given that the **cache miss rate is 0.4**, and the response time for cached data is **0.01 seconds**, compute the new total response time with caching in place. [6]



Q3. NUCES FAST University operates its own authoritative DNS servers. The university's flex portal domain name is 'flex.nu.edu.pk'. There is also a local DNS resolver used by all students and staff in the university. [20 marks]

- Describe the step-by-step process that occurs when the student from his new laptop attempts to open portal.flex.nu.edu.pk. (Assume there is no record saved in the cache of local DNS server).
- Explain how DNS caching works in this scenario. If the local DNS resolver has a cached record for portal.flex.nu.edu.pk, how does the TTL value affect the resolution process?
- When the local DNS resolver queries the Top-Level Domain (TLD) server for .pk, what type of DNS resource record will the TLD server send in response?
- Explain the core difference between recursive and iterative DNS queries.
- Which type of query is used by the student's laptop when it contacts the local DNS resolver?