National University of Computer and Emerging Sciences
Chiniot-Faisalabad Campus

Computer Networks (CS3001) Sessional-I Exam

Date: September 24th 2024

Course Instructor(s)

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Total Time (Hrs):	1
Total Marks:	35
Total Questions:	3

Student Signature

Roll No   Section

Vetted by: _____   Signature: _____

Q1	CLO#3	Q2	CLO#3	Q3	CLO#2	Total Marks
15		06		14		35

Attempt all the questions.

CLO #3: Demonstrate various classical routing and switching protocol via simulators.

Q2: The figure below illustrates a switched network. Consider a message that is $7.5 * 10^6$ bits long to be sent from the source to the destination. (Assume header size is negligible relative to the entire message size). Suppose each link is 1.5 Mbps. Focus on transmission delays only and assume all other delay components are negligible. [2*3=06 marks]

Source   Packet switch   Packet switch   Destination
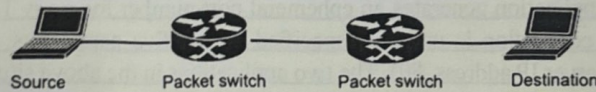
1. Consider sending the message from source to the destination without message segmentation. How long does it take to move the message from the source host to the first packet switch? Keep in mind that each switch uses store-and-forward packet switching. What is the total time to move the message from source to the destination host?

   Answer: $7.5 * 10^6 / 1.5 * 10^6 = 5$ sec.
   Total delay = 5 sec × 3 hops = 15 sec.

2. Now suppose that the message is segmented into 5000 packets, with each packet being 1500 bits long. How long does it take to move the first packet from source to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. At what time will the second packet be fully received at the first switch?
   Answer: $1500/1.5 * 10^6 = 1$ msec.
   Time at which second packet is received at the first switch is the time at which first packet is received at the second switch: 2×1 msec = 2msec.

3. How long does it take to move the file from source host to destination host when message segmentation is used?

Answer: Time at which the first packet is received at the destination host is 3msec. After this, every 1msec one packet will be received thus, time at which the last or 5000th packet is received is:

$$3msec + 4999 * 1msec = 5.002 \text{ sec.}$$

CLO #2: Describe utilization of network protocol concepts vis-a-vis OSI and TCP/IP stack.

Q3: Answer the following questions precisely. Unnecessary details will lead to marks deduction.

[3*2+8=14 marks]

1. Despite developing an application for routers to address security issues like IP spoofing, DDoS attacks, and improve TCP functionality, a group of students from NUCES found that the network continued to face security challenges. What mistake might the developers have made?

   _____

2. Name and describe two types of packet/frame errors that occur in the transmission of packets/frames.
   a. **Lost packet/Frame** – A frame fails to arrive at the receiver. A noise burst may damage a frame to the extent that the receiver is not aware that a frame has been transmitted.
   b. **Corrupted/Damaged packet/Frame** -- A recognizable frame does arrive but some of the bits are in error.

3. Suppose a user has two browser applications active at the same time, and suppose that the two applications are accessing the same server to retrieve HTTP documents at the same time. How does the server tell the difference between the two applications?

   Answer: A client application generates an ephemeral port number for every TCP connection it sets up. An HTTP request connection is uniquely specified by the five parameters: (TCP, client IP address, ephemeral port #, server IP address, 80). The two applications in the above situations will have different ephemeral port #s and will thus be distinguishable to the server.

4. The web page "/portal" was updated on 23-09-2024, and a client accessed this page on 10-09-2024 firstly, now he requested this web page again on 24-09-2024. [2+3+3=8 marks]
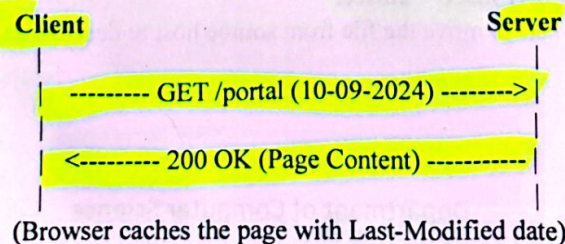   1. What request method(s) will be used to access this page? Also, mention the protocol name.
      Method(s): __**Conditional GET Method**__

      Protocol: __**HTTP or HTTP/1.1 or HTTP/2**__

   2. On client browser, what action will be taken while accessing the page on 10-09-2024? Draw client-server messages interaction flow diagram. [3]
      Answer:
      On the first access to the web page on **10-09-2024**, there is no cached copy of the page in the client's browser, so the browser will directly request the page from the server.

```
     Client                                        Server
       |                                             |
       |--------- GET /portal (10-09-2024) --------->|
       |                                             |
       |<--------- 200 OK (Page Content) ------------|
       |                                             |
```

(Browser caches the page with Last-Modified date)

3. What will be the scenario of client and server messages interaction while accessing this web page on 24-09-2024? Draw client-server messages interaction flow diagram. [3]

Answer:

On **24-09-2024**, when the client requests the /portal page again, the browser will check the cache to see if it has a stored copy of the page. Since the cache contains an outdated version of the page (cached from 10-09-2024), the browser will use conditional GET method with the *If-Modified-Since* header to ask the server whether the page has been updated.

```
Client                                              Server
  |                                                   |
  |    --- GET /portal (If-Modified-Since: 10-09-2024) --> |
  |                                                   |
  | <---------     200 OK (Updated Page) ---------------- |
  |                                                   |
```

(Browser updates the cached page with new content)