Computer Networks (CS3001)

Date: May 27th 2024

Course Instructor(s)

Mr. Nauman Moazzam Hayat

Ms. Umm-e-Ammarah

Final Exam

Total Time: 3 Hours
Total Marks: 80
Total Questions: 8

Semester: SP-2024
Campus: Lahore
Dept: Computer Science / Software Engineering

Student Name _____ Roll No _____ Section SE-6C Student Signature _____

Instruction/Notes:
- Attempt all questions on the provided separate answer sheet.
- Clearly write corresponding question number and part number at the top centre of the answer sheet with a thick pen / marker before starting a new question / answer.
- Fill in the corresponding tables for the relevant questions in the additional sheet provided which is named "Figures & Tables" and attach it with the answer sheet.
- In case, you use rough sheets, they should NOT be attached to the final answer sheet.

CLO 1:

Q1: Answer the following multiple-choice questions by filling **Table 1** in the additional sheet named "Figures & Tables": **[1 * 10 = 10 Marks]**

Note: Any answers outside the table will NOT be marked. Moreover, cutting and overwriting is not allowed.

1.1. _____ transfers messages from senders' mail servers to the recipients' mail servers.
A. Simple Network Management Protocol
B. Hyper Text Transfer Protocol
C. Simple Mail Transfer Protocol
D. Transmission Control Protocol

1.2. Elastic Applications are Apps that
A. Are highly customizable for each user
B. Require a minimum throughput to work
C. Make use of whatever throughput they get
D. None of the above

1.3. The sending rate in TCP is adjusted according to the:
A. Congestion Window (cwnd)
B. Receive Window (rwnd)
C. Minimum of (cwnd , rwnd)
D. Urgent Data Pointer

1.4. The Default Subnet Mask for a Class C IP address is
A. 255.255.255.255
B. 255.255.255.0
C. 255.255.0.0
D. 255.0.0.0

1.5. If an AS learns through _____ protocol that subnet x is reachable from more than one other ASes, choosing the gateway that has the smallest _____ is called _____.

A. inter-AS; least cost; hot potato routing
B. inter-AS; least cost; cold potato routing
C. intra-AS; least cost; hot potato routing
D. intra-AS; average cost; hot potato routing

1.6. Although a node senses the carrier before transmitting, collisions can still occur in CSMA because

A. of propagation delay
B. of transmission delay
C. of processing delay
D. collisions do not occur in CSMA

1.7. Time needed to perform an integrity check, lookup packet information in a local table and move the packet from an input link to an output link in a router.

A. Queueing delay
B. Processing delay
C. Transmission delay
D. Propagation delay

1.8. A node can get it's own IP address : IP address of another node on the internet : MAC Address of a node on the same LAN respectively via

A. DHCP : ARP : DNS
B. DNS : DHCP : ARP
C. ARP : DNS : DHCP
D. DHCP : DNS : ARP

1.9. A switch having 7 interface, will have:

A. 7 MAC addresses
B. 5 MAC addresses
C. 1 MAC address
D. No MAC address

1.10. One similarity : One Difference between a switch & a router are: (Please choose only one option from below for which both the statements are correct)

A. Both switch and router are plug & play : Switch is a Layer 2, while Router is a Layer 3 device
B. Both have forwarding tables : Switch participates in local delivery while routers in global delivery
C. Both use store and forward : Switch uses broadcasting while router uses flooding
D. None of the above option is entirely true

CLO 2:

Q2: Refer to **Figure 2** in the additional sheet named "**Figures & Tables**", suppose a caravan has 20 cars, and the tollbooth services a car at a rate of one car per 2 seconds. Once serviced, a car proceeds to the next toll booth, which is 400 kilometers away at a rate of 10 kilometers per second. The entire caravan must be queued at a tollbooth before the first car in the caravan can be serviced (i.e. pay its toll and begin driving towards the next tollbooth.)

Answer all the parts a, b, c , d and e in the answer sheet. **[2 * 5 = 10 Marks]**

a. How long does it take for the entire caravan to receive service at the tollbooth (that is the time from when the first car enters service until the last car leaves the tollbooth)?
b. Once the first car leaves the tollbooth, how long does it take until it arrives at the next tollbooth?

c. Once the first car leaves the tollbooth, how long does it take until it enters service at the next tollbooth?
d. Are there ever two cars in service at the same time, one at the first toll booth and one at the second toll booth? And Why?
e. Are there ever zero cars in service at the same time, i.e., the caravan of cars has finished at the first toll booth but not yet arrived at the second toll booth? And Why?

CLO 2:

Q3 (a): A user is trying to visit a website www.example.com, but her browser doesn't know the IP address. Using iterative DNS query, answer all parts i till v in the answer sheet. [1 * 5 = 5 Marks]

i) Where does the Local DNS server check first (Where does it send the DNS query first)?
ii) Where does the Local DNS Server check next (Where does it send the DNS query next)?
iii) Where does the Local DNS Server check next (Where does it send the DNS query next)?
iv) What type of DNS Record (RR) is returned in response to this DNS Query?
v) Which type of DNS query is considered best practice (Iterative or Recursive)?

(b) Below is a server to client HTTP Response Message. Answer all parts i till v in the answer sheet: [1 * 5 = 5 Marks]

```
HTTP/1.0 404 Not Found
Date: Tue, 07 May 2024 11:33:45 +0000
Server: Apache/2.2.3 (CentOS)
Content-Length: 258
Connection: Close
Content-type: text/html
```

i) Was the server able to send the file (object) successfully?
ii) Is the HTTP connection persistent or non persistent?
iii) What is the type of the file (object) being sent?
iv) What is the size of the file (object) being sent in bytes?
v) What is the name & version of the server?

CLO 2:

Q4: Refer to Figure 4 in the additional sheet named "Figures & Tables, the left and right TCP clients communicate with a TCP server using TCP sockets. The three sockets shown in server were created as a result of the server accepting connection requests on this welcoming socket from the two clients. Fill in Table 4 in the additional sheet named "Figures & Tables." [8 Marks]

CLO 3:

Q5: Refer to Figure 5 in the additional sheet named "Figures & Tables, IPv6 subnets connected by a mix of IPv6-only routers, IPv4-only routers & IPv6/IPv4 routers. A host of subnet D wants to send an IPv6 datagram to a host on subnet B. The forwarding between these two hosts goes along the path: D --> E --> d --> c --> B. Answer all the parts i till x in the answer sheet: [1 * 10 = 10 Marks]

i) Is the datagram being forwarded from D to E an IPv4 or IPv6 datagram?
ii) Is this D to E datagram encapsulating another datagram? Yes or No?
iii) Is the datagram being forwarded from E to d an IPv4 or IPv6 datagram?

iv) Is this E to d datagram encapsulating another datagram? Yes or No?
v) Is the datagram being forwarded from d to c an IPv4 or IPv6 datagram?
vi) Is this d to c datagram encapsulating another datagram? Yes or No.
vii) Is the datagram being forwarded from c to B an IPv4 or IPv6 datagram?
viii) Is this c to B datagram encapsulating another datagram? Yes or No.
ix) Which router is the 'tunnel entrance'?
x) Which router is the 'tunnel exit'?

CLO 3:

Q6 (a): Refer to **Figure 6** in the additional sheet named "**Figures & Tables**, run Dijkstra's Algorithm and fill in **Table 6** in the additional sheet named "**Figures & Tables**." **[6 Marks]**

(b) What are the 4 route selection rules (in order) in BGP, if more than one route is available for a specific destination. Write your answer in the answer sheet: **[1 * 4 = 4 Marks]**

CLO 3:

Q7: Refer to **Figure 7** in the additional sheet named "**Figures & Tables**, consider the LAN consisting of computers connected by two self-learning Ethernet switches. At t = 0, the switch table entries for both switches are empty. At t = 1, 2, 3, 4, 5, 6, 7, 8, and 9, a source sends a frame to a destination as shown below, and the destination replies immediately at the same time t(well before the next time step, for example if source sends at t = 9, the destination also replies at t = 9, i.e. it replies before t = 10.) Answer all the parts i till v in the answer sheet: **[2 * 5 = 10 Marks]**

i) At t = 9, which node sent a frame to which node? (If there is only enough information for 1 node, write that node, if there's no information, write 'n/a')
ii) At t = 6, which node sent a frame to which node? (If there is only enough information for 1 node, write that node, if there's no information, write 'n/a')
iii) At t = 3, which node sent a frame to which node? (If there is only enough information for 1 node, write that node, if there's no information, write 'n/a')
iv) At t = 7, which node sent a frame to which node? (If there is only enough information for 1 node, write that node, if there's no information, write 'n/a')
v) At t = 11, which node sent a frame to which node? (If there is only enough information for 1 node, write that node, if there's no information, write 'n/a')

CLO 3:

Q8 (a): Answer both parts (i) & (ii) in the answer sheet: **[1 * 2 = 2 Marks]**
i) Which of the three (OSPF, iBGP, eBGP) carry intradomain (or intra-AS) routing information?
ii) Which of the three (OSPF, iBGP, eBGP) carry interdomain (or inter-AS) routing information?

(b) Refer to **Figure 8** in the additional sheet named "**Figures & Tables**, consider an IP datagram being sent from node D to node B. Answer all the parts i till v in the answer sheet: **[2 * 5 = 10 Marks]**

i) What is the source mac address at point 5?
ii) What is the destination mac address at point 5?
iii) What is the source IP address at point 5?
iv) What is the destination IP address at point 5?
v) What is the source mac address at point 3?