CSS331: Fundamentals of Data Communications

Final Mock Exam

curated by The Peanuts

Name.....ID.....Section.....Seat No.....

Conditions: Semi-closed Book

Directions:

1. This exam has 11 pages (including this page).
2. Write your name clearly at the top.
3. Read the questions carefully. They were handcrafted with love (and mild evil) by The Peanut Team.
4. Show your work where applicable, partial credit is real, but miracles are not.
5. Answers must be written in **English**. Binary or Morse code will not be graded.
6. You may use your notes. You may not use your neighbor's notes, brain, or soul.

For solution, ***click here****.*

Part 1: Multiple Choice Questions

1. In Stop-and-Wait ARQ, if propagation time is 200 ms and frame transmission time is 50 ms, what is the link utilization?

a) 11.1%

b) 20.0%

c) 25.0%

d) 50.0%

2. What is the maximum window size for Selective Repeat ARQ with 3-bit sequence numbers?

a) 3

b) 4

c) 7

d) 8

3. Five channels, each requiring 4 kHz bandwidth with 500 Hz guard bands between channels, need to be multiplexed using FDM. What is the minimum total bandwidth required?

a) 20 kHz

b) 22 kHz

c) 22.5 kHz

d) 24 kHz

4. What is the main advantage of Statistical TDM over Synchronous TDM?

a) Simpler implementation

b) No need for addressing

c) More efficient bandwidth utilization

d) Faster transmission speed

5. In circuit switching, which component is responsible for establishing and maintaining connections?

a) Subscriber

b) Exchange (Switching center)

c) Trunk

d) Local loop

6. What is the main difference between Virtual Circuit and Datagram packet switching?

a) Virtual circuits are faster

b) Datagrams require connection setup

c) Virtual circuits establish a path before sending data

d) Datagrams use larger packets

7. What is the cell size in ATM networks?

a) 48 bytes

b) 53 bytes

c) 64 bytes

d) 128 bytes

8. Which ATM service category is most suitable for real-time video conferencing?

a) UBR (Unspecified Bit Rate)

b) ABR (Available Bit Rate)

c) CBR (Constant Bit Rate)

d) rt-VBR (Real-time Variable Bit Rate)

9. What is the default subnet mask for a Class B IP address?

a) 255.0.0.0

b) 255.255.0.0

c) 255.255.255.0

d) 255.255.255.128

10. If you borrow 3 bits from the host portion of a Class C network, how many usable subnets can you create?

a) 4

b) 6

c) 7

d) 8

11. What is the main problem with Distance Vector routing that "split horizon with poisoned reverse" solves?

a) Slow convergence

b) Counting to infinity

c) Large routing tables

d) High bandwidth usage

12. Which routing algorithm requires complete knowledge of network topology?

a) Bellman-Ford (Distance Vector)

b) Dijkstra's (Link State)

c) Static routing

d) RIP (Routing Information Protocol)

13. What is the main disadvantage of Bus topology?

a) Expensive to implement

b) Difficult to add new nodes

c) A cable break disables the entire network

d) Requires complex routing

14. Which protocol is used for sending email between mail servers?

a) POP3

b) IMAP

c) SMTP

d) HTTP

15. Based on the *Yamaha Disklavier guest lecture*, what is the main advantage of MIDI data over audio recordings for remote piano performance?

a) Better sound quality

b) Much smaller file size

c) Easier to edit

d) Works without internet connection

Part 2: Written Questions

Question 1

Compare Go-back-N ARQ and Selective Repeat ARQ.

(a) If Frame 3 is lost in a window of size 7, explain what happens in each protocol.

(b) Which protocol is more bandwidth efficient and why?

Question 2

Given the IP address 172.25.142.88 with a subnet mask of 255.255.255.192, find:

(a) The class of this IP address

(b) The major network address

(c) The subnet address

(d) The first valid host address in this subnet

(e) The last valid host address in this subnet

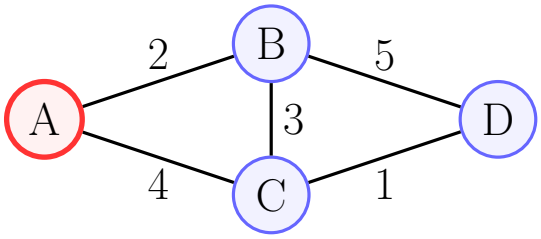
(f) The broadcast address for this subnet

(g) How many bits were borrowed from the host portion for subnetting?

(h) How many valid hosts can this subnet support?

Question 3

Using Dijkstra's algorithm, find the shortest path from Node A to all other nodes in the following network. Show your iteration table.



Using the same network from *Question 3*, now use the **Bellman-Ford algorithm** to find the shortest paths from all nodes to destination **node D**. Complete the following table showing the distance and next hop for each iteration:

Question 4

Explain the difference between **SMTP**, **POP3**, and **IMAP** protocols.

Aspect	SMTP	POP3	IMAP
Type (Push / Pull)			
Purpose			
Where emails stored after retrieval			
Best for			

Question 5

A company is designing their network infrastructure:

Requirements:

- Connect 5 buildings on campus (LAN)
- Connect to 3 remote branch offices (WAN)
- Support real-time video conferencing
- Support email and file sharing

Answer the following:

(a) Which LAN topology would you recommend for each building and why? (Consider cost, reliability, and scalability)

(b) Which WAN topology would you choose to connect the branch offices and why? Compare at least TWO options (e.g., Star vs Partial-mesh).

(c) For real-time video conferencing, would you use circuit switching or packet switching? Justify your answer with at least TWO reasons.