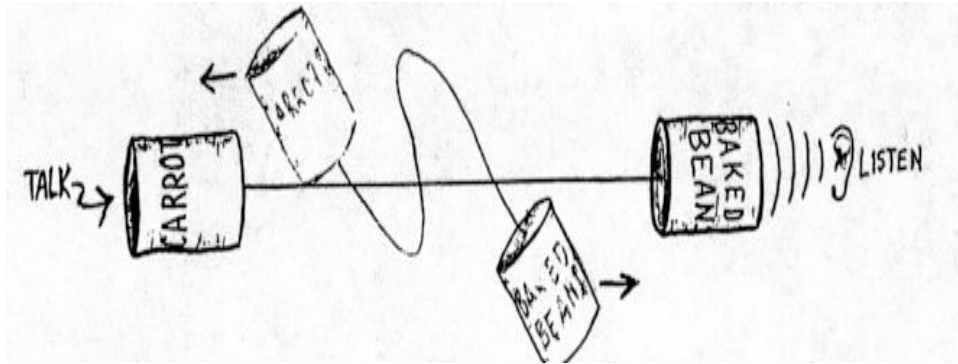
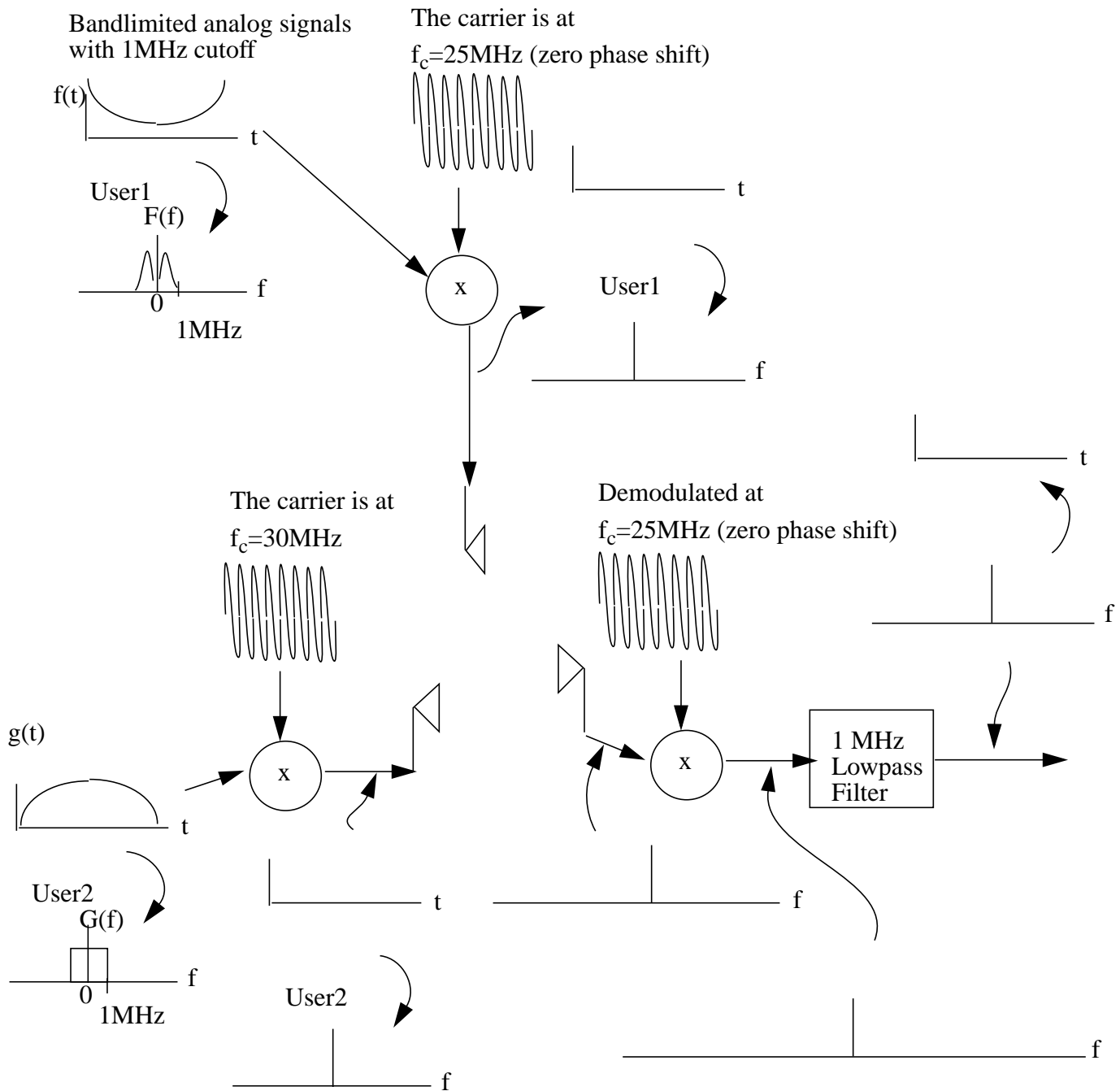


Part 1: (value 5 - 1 mark each)

When you pull the string tight and talk into one of the cans of your tin can telephone, the sound vibrates across the taut string to the other can.

1. Is the tin can telephone full duplex? Explain.
2. In wireless 802.11, how does the transmitting station know that a message is received?
3. Is wireless 802.11 full duplex? Explain.
4. In 802.11 if a receiving station detects a frame error (CRC error) what does it do?
 - a) Drop the frame and return a negative acknowledgment
 - b) Drop the frame and return an positive acknowledgement
 - c) Correct the CRC error and return an acknowledgement
 - d) Drop the frame and do nothing
5. Having sent a frame on a **wired** Ethernet LAN, how does the transmitting station know the frame was received?

Part 2 Modulation Bits (value 10 - 1 mark each)

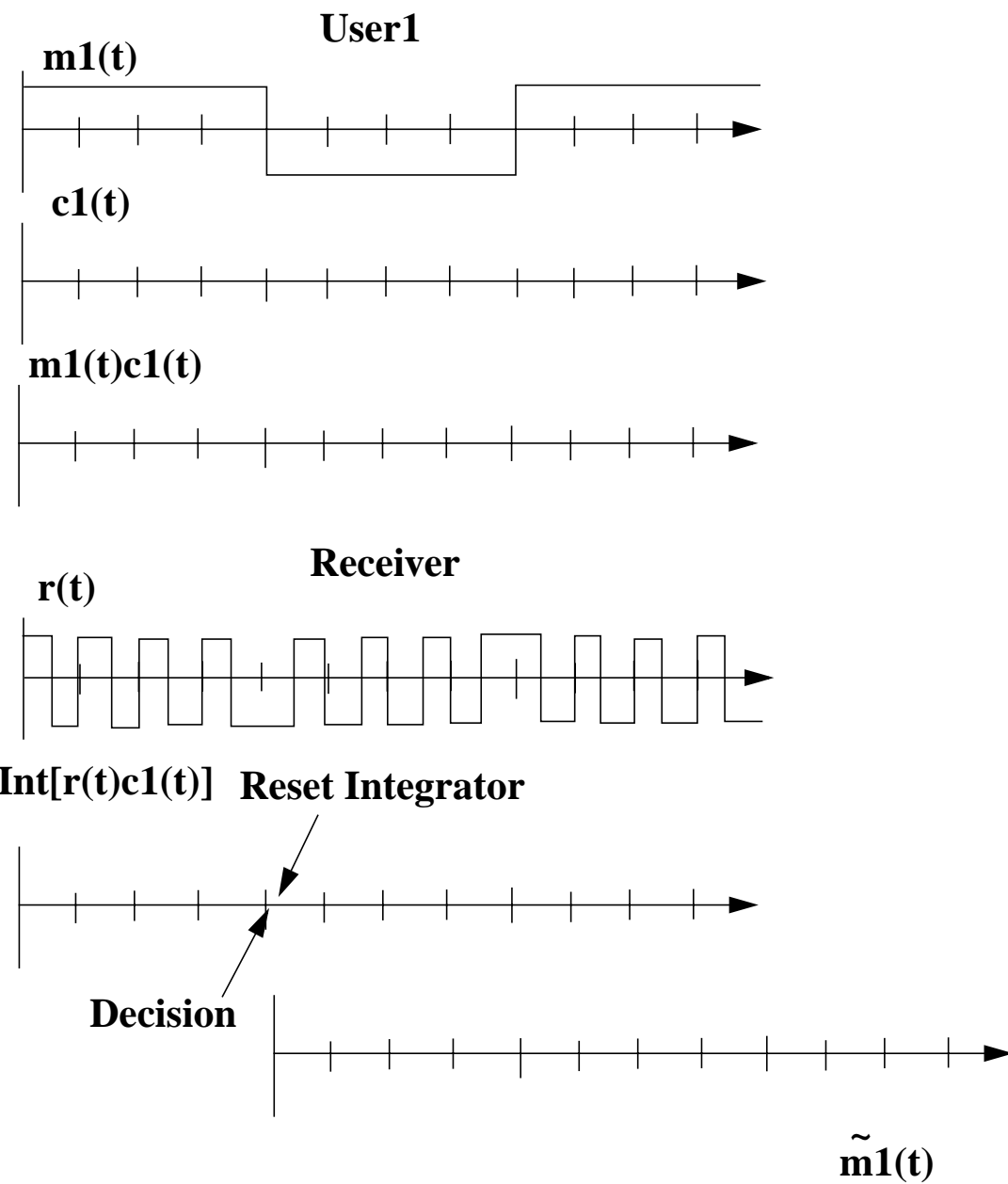


6. Draw the time domain and frequency domain representations for each leg of the above network.
7. What technology best describes the technology used above? (TDM, FDM, CDMA)
8. What would be required to make the above system full duplex?

Part 3 Spread Spectrum (value 5 - 1 marks each)

Table 1:

User	Code
m1	1 -1 1 -1 -1 1 1 -1



9. What is the spreading gain of this system and what is spread?

Part 4 Acronyms: (value 5 - 1 mark each)

For questions :

What do the following terms or acronyms stand for and mean?

e.g. Question and answer: WDM: WDM stands for wavelength division multiplexing. WDM associates a channel with a given wavelength.

10. TDMA:

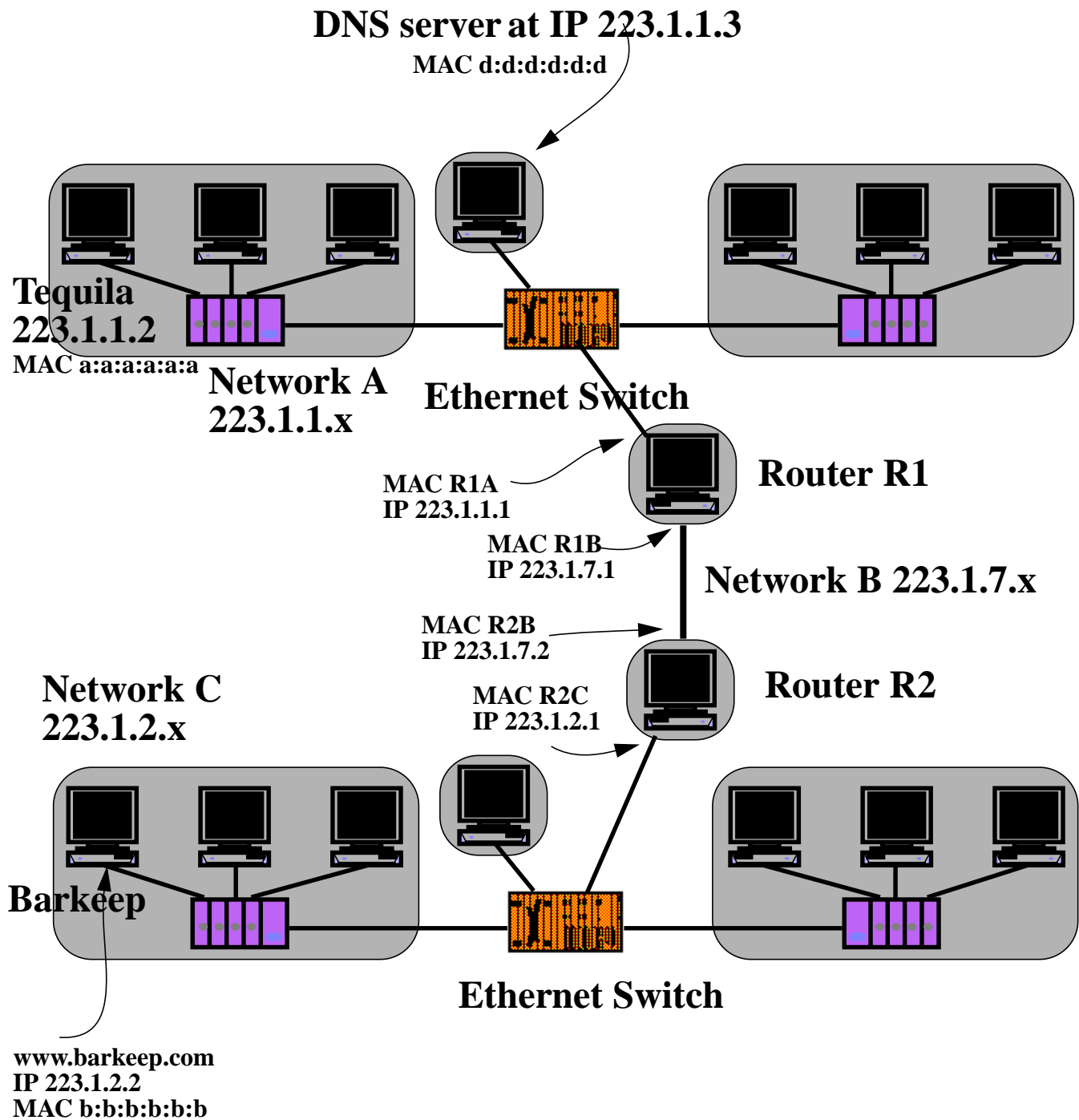
11. CSMA/CD:

12. ARP:

13. IP:

14. DHCP:

This illustration is to be used with the questions in Part 5.
This page may be ripped out of the test, and does not need to be returned.



Part 5 IP: (value 15 - {3, 3, 1, 1, 7})

15. Fill in the routing table in Router 2. The number of hops is defined as the number of routers.

Table 2: Routing Table for Router 1

Network Entry	Next Router	Number of Hops	Output Port MAC
Network A:			
Network B:			
Network C:			

16. An IP packet is transmitted from host Tequila to host Barkeep. Fill in the following table with the IP packet's source and destination IP and encapsulating ethernet frame's MAC addresses for each network leg that the packet takes.

Network Leg		Source	Destination
First Leg	IP address		
	MAC address		
Second Leg	IP address		
	MAC address		
Third Leg	IP address		
	MAC address		

17. IP addresses are essentially composed of a network and a host part. What is the network part of the IP address for **Network A**?

18. If **tequila** wants to send a packet to IP 223.1.2.3, how does it know it is to route it to R1.

19. Assuming that all ARP tables are initially empty, the routing tables are stable, and the DNS server can resolve any request, the IP address of the DNS server is known. Show the sequence of packets that will occur for **Tequila** to send a single IP packet to **www.barkeep.com**. Provide sufficiently detail comments with each transaction.

e.g. Tequila DNSserver

Tequila Arps for MAC address of the DNSserver

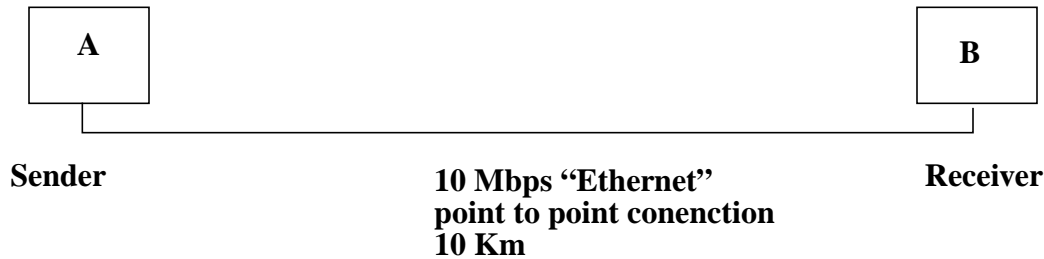
Tequila DNSserver Router R1 Router R2 Barkeep

time



Part 6 General Packet Question :(value 5)

Given the following network.



The sender wants to send a 1.5M Byte file to the receiver. The protocol will be stop and wait. Assume if the ack was not received when expected, the packet is lost and immediately retransmitted.

20. What is a “stop and wait protocol”?

Given: The sender will break the file into 1500 Byte DATA packets. While the receiver will reply with 100 Byte ACK packets. Strong CRC codes are used to check the data and acks.

21. What is the transmission time for the DATA packet? What is the propagation time assuming the velocity of the electromagnetic signal is $c=3 \times 10^8$ m/sec?

22. What is the total time to send an entire Data Packet reliably (i.e. with knowledge that it was received).

23. What is the total time to send the file? Assume the channel is error free.

Assume now that the channel has a BER (Bit Error Rate) of 1×10^{-5} .

24. What is the probability that the DATA packet contains an error? What is the probability that the ACK packet contains an error?

25. With a BER (Bit Error Rate) of 1×10^{-5} , what is the total time anticipated to transfer the 1.5MByte file? (only consider the potential of a DATA packet error, i.e. ignore ACK packets). This might be helpful, if probabily of flipping a head with a coin is p , the expected number of heads in n flips is np .