B.Sc. Engg. / HD CSE 4th Semester **11 January 2021**

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION **SUMMER SEMESTER, 2019-2020**

DURATION: 1 HOUR 30 MINUTES **FULL MARKS: 100**

CSE 4405: Data and Telecommunications

There are **3 (three)** questions. Answer all of them. Figures in the right margin indicate marks.
Write Student ID and Name top of the **first page** and write **studentID and page no in every page** of the answer script.
Submission pdf of the answer script should be named as **Full_Student_ID<space>Course Code.pdf**

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1. a) Transmission of information in any network involves end-to-end addressing and sometimes local addressing (such as VCI). Figure 1.a) shows the types of networks and the addressing mechanism used in each of them. 3X3

Network	*Setup*	*Data Transfer*	*Teardown*
Circuit-switched	End-to-End		End-to-End
Datagram		End-to-End	
Virtual-circuit	End-to-End	Local	End-to-End

Figure 1.a): Type of networks with their addressing mechanism

Answer the following questions:

I. Why does a circuit-switched network need end-to-end addressing during the setup and teardown phases? Why are no addresses needed during the data transfer phase for this type of network?

II. Why does a datagram network need only end-to-end addressing during the data transfer phase, but no addressing during the setup and teardown phases?

III. Why does a virtual-circuit network need addresses during all three phases?

b) We know that two types of networks, datagram and virtual-circuit, need a routing or switching table to find the output port from which the information belonging to a destination should be sent out, but a circuit-switched network has no need for such a table. **Give the reason for this difference**. An entry in the switching table of a virtual-circuit network is normally created during the setup phase and deleted during the teardown phase. In other words, the entries in this type of network reflect the current connections, the activity in the network. In contrast, the entries in a routing table of a datagram network do not depend on the current connections; they show the configuration of the network and how any packet should be routed to a final destination. The entries may remain the same even if there is no activity in the network. The routing tables, however, are updated if there are changes in the network. **Explain the reason for these two different characteristics.** 4+4.33

c) Using the CRC error detection scheme do the following. (Use 1011 and 0000 as the divisors) 4+4

I. Generate the codeword of 1001 using the CRC encoder.

II. A codeword 1000110 has been received. Determine whether the dataword should be accepted or rejected using the CRC decoder.

d) How does a block code differ from a cyclic code? Distinguish between forward error correction and error correction by retransmission. 8

2. a) How does CDMA differ from FDMA and TDMA? Find the chips for a network with 12 stations using Walsh table. 3+5

b) Briefly explain the persistent methods used by CSMA protocol. Considering the *P-persistent* method, draw the flowchart of CSMA/CD protocol. 5+5

c) With necessary examples and figures briefly explain the comparative analysis of the link control protocols. 15.33

3. a) What are the rationales for hexagonal cell geometry for cellular communication? Explain the co-channel interference and system capacity of a cellular network with appropriate figure and equation. 3+12

b) Briefly explain the concept of Trunking and Grade of Service (GoS). 8.33

c) A small city of 150000 residents has two competing mobile networks companies named G and R that provide cellular service to the users. Company G has 50 cells, each with 40 channels and company R has 100 cells, each with 20 channels. Find the number of users that can be supported at 10% blocking probability if each user averages 4 calls per hour at an average call duration of 5 minutes. Compute the percentage market penetration of each company assuming that both the companies are operated at maximum capacity. 10

OR

a) Suppose a new mobile communication standard is specified as an alternative to GSM with the following frequency specifications 8

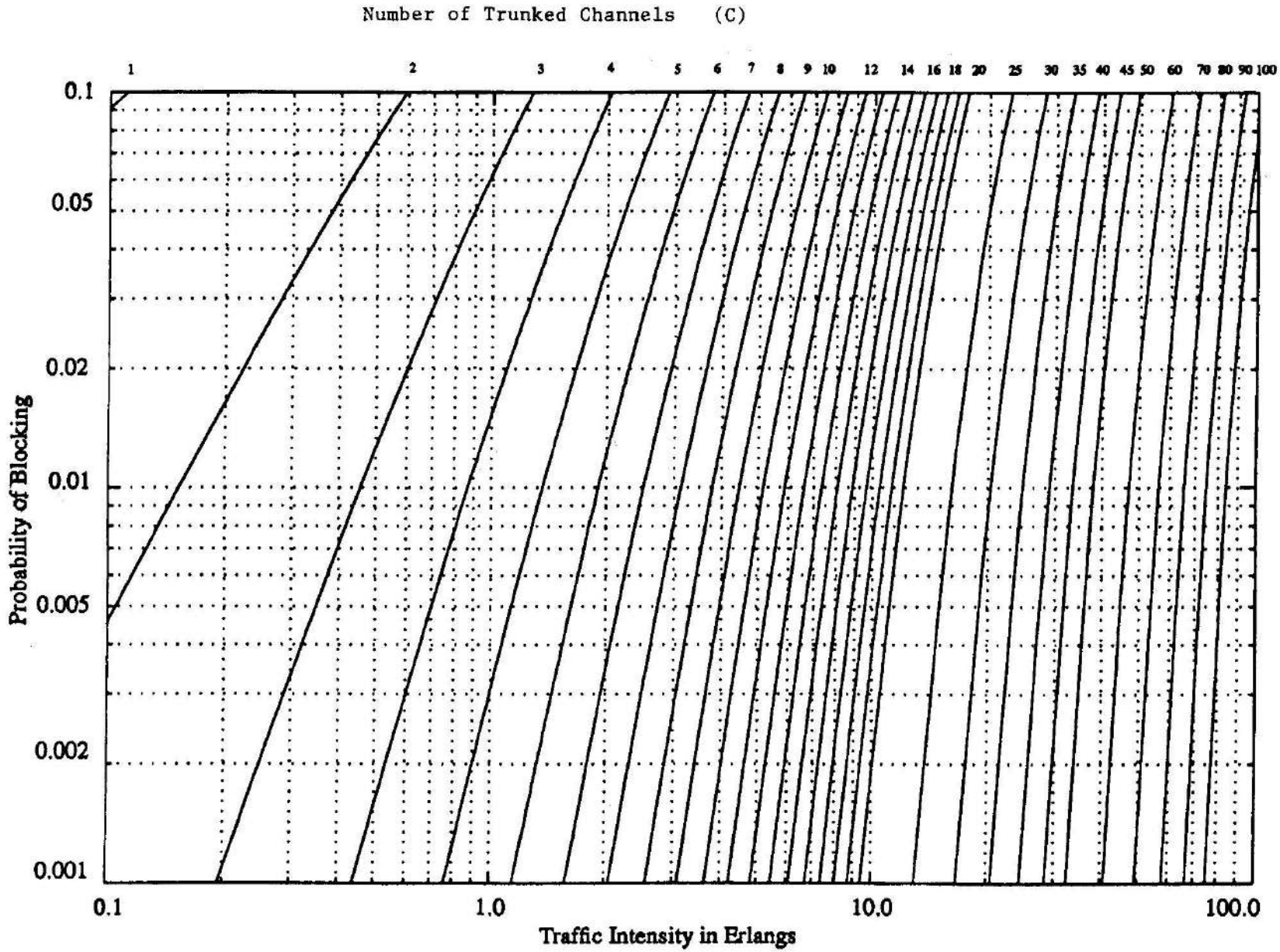
Uplink: 2400-2600 MHz Downlink: 2800-3000 MHz

The new standard also specifies that two carrier frequencies would be working at 400 KHz distance for better voice quality. As a telecommunication engineer, calculate the following specification of the new standard.

I. Wavelength II. Bandwidth III. Duplex Distance IV. No of Radio Channels

b) Draw the normal burst used in GSM. Demonstrate how four GSM bursts (each of 156.25 bits) are constructed from a 20 milliseconds voice signal following the steps of the GSM transmission process. 2+12

c) What is MAHO? With the aid of necessary diagrams explain how a call initiated by a mobile user is established. Mention the name of different logical channels used in different stages of call establishment. 3+8.33



The Erlang B chart showing the probability of blocking as functions of the number of channels and traffic intensity in Erlangs.