King Saud University
College of Computer and Information Sciences
Computer Science Department

Course Code	CSC 329		
Course Title	Computer Networks		
Section No.			
Semester	S2 – Spring 21		
Exam	End semester exam		
Date	April, 20th 2021	**Duration**	120 min
Student Name			
Student ID			

Course Learning Outcomes		**Relevant question**	**Full mark**	**Student mark**
CLO 1	**The ability to describe major networking terms, topologies, types, protocols, devices, and components.**	NA		
CLO2	**The ability to explain the main services, type of addressing, and protocols associated with each layer of the OSI model.**	NA		
CLO 3	**The ability to recognize signal types, characteristics, impairments, encoding methods, transmission media.**	Q2 & Q4		
CLO 4	**The ability to recognize the functions and protocols of the data link layer (**framing, error control, flow control, medium access control.)	Q1, Q3 & Q4		
CLO 5	**The ability to explain the functions and protocols of the network layer and to describe the different routing approaches:** (datagram , VC , addressing, Routing).	Q2, Q3		
CLO 6	**The ability to compare the features of network components and to measure and analyze the time performances of a network.**	Q2, Q4		

Feedback/Comments:

Q1. (6 marks)

1. Represent and briefly describe the algorithm of CSMA/CA for MAC sublayer

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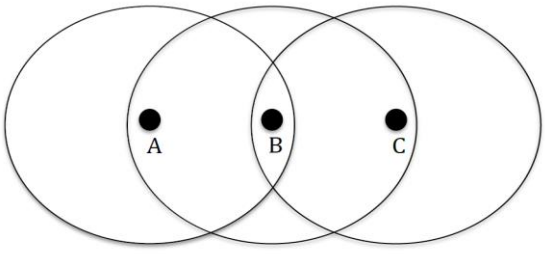
The figure below shows three wireless nodes and their transmission ranges.



2. Use this figure to explain the concept of "hidden node" problem in wireless communication.

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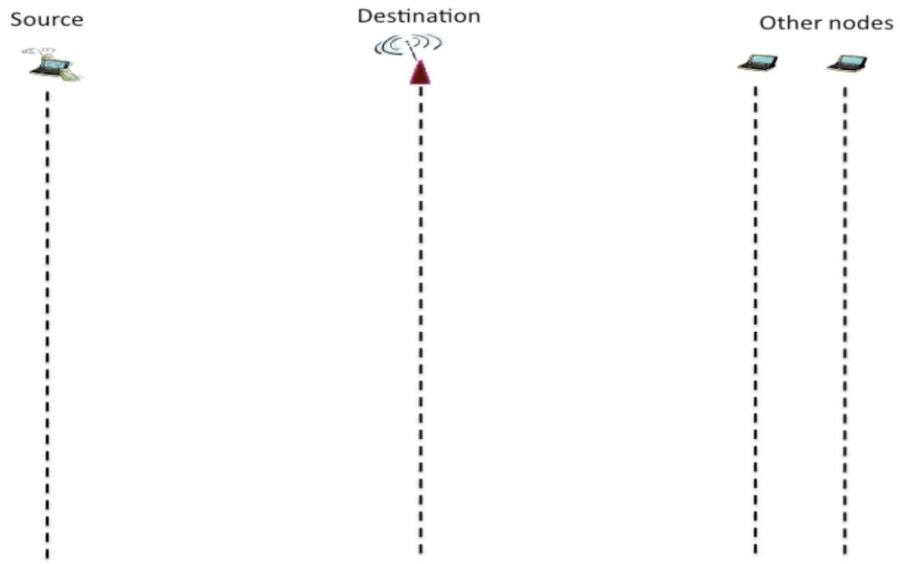
3. Use an exchange diagram (as represented below) to explain how CSMA/CA protocol can resolve this problem with the use of RTS/CTS and NAV. For your explanation, assume that the source wants to send a frame to the destination.



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4. The exchange of RTS/CTS in the CSMA/CA reduces the efficient throughput in the wireless network. Explain how?

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5. Explain with a diagram how CSMA/CA uses different inter-frame spaces to avoid collusion?

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6. Explain the main difference between FDMA and TDMA

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Q2. (4 marks)

1. Explain the difference between routing and forwarding processes of packets.

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2. Explain how the packet at the input of the router are forwarded to the adequate output using the forwarding table

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Q3. (4 marks)

Consider a machine that has the IP address 192.168.92.10

1. Suppose that we are using class-based addressing. To which class of address belongs this IP address?

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2. If the network is not divided into subnets. What is the network mask in this case?

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3. If the network administrator had decided to break the network into 8 different subnets, what would the network mask?

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4. How many machines can be connected for every subnet?

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Q4. (6 marks)

A.

Consider a wireless network using the CSMA/CA with RTS/CTS mechanism. We suppose that the propagation delay is α, SIFS is α, DIFS is 4α, and RTS and CTS are 6α respectively. α is a constant that is expressed in second.

1. Express using α, the earliest time for the receiver to send the CTS message?

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2. If the data packet needs 100α to be transmitted, what is the shortest time for the receiver to send the ACK signal?

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3. A TDMA system uses 320 kbps data rate to support 8 users. What is the data rate provided for each user?

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B.

Assume we send a file with a sliding window protocol from Riyadh to a host in Jeddah. We do not know exactly all the details of the sliding protocol, but we do know the following:

- The file is composed of n = 10 packets each one of a size L = 104 bits.

- The bit rate available for transmission is $R = 10^6$ bps.
- Assume that the propagation time is equal to T_{pr} sec

1. Assume that the sender uses a window size W = 1 packet. The destination sends one ack for every packet received. What is the minimum time it takes to transmit the file and receive all necessary acknowledgements? (give the expression using T_{pr})

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2. Suppose now that the window size $W \geq n$ packets. What is the minimum time it takes to transmit the file and receive all necessary acknowledgements?

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