KINGDOM OF SAUDI ARABIA
AL-IMAM UNIVERSITY
FACULTY OF COMPUTER SCIENCE
AND INFORMATION

المملكة العربية السعودية
جامعة محمد بن سعود الإسلامية
كلية علوم الحاسب والمعلومات

Dep.: Computer Science
Classroom: 40201
Year: 1432-1433
Date: 08/01/1433

Course: Advanced Networks (CS530)
Dr. Miled Tezeghdanti
First Semester
Allowed Time: 1h30

الاسم	
الرقم الجامعي	
التوقيع	

Midterm Exam Solution (5 Pages, 3 Questions)

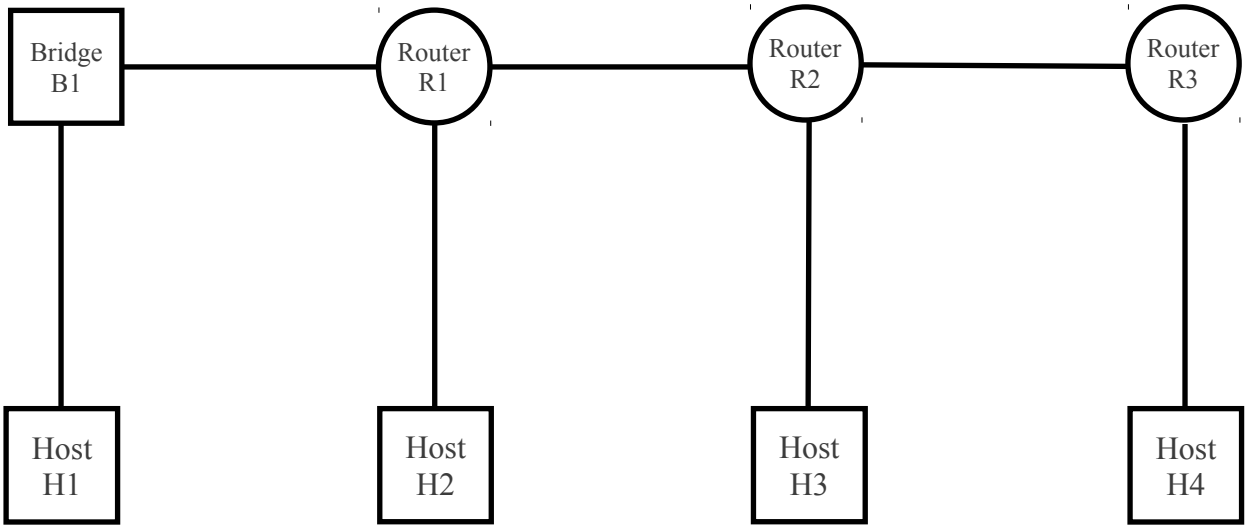
(Marks: 20 Points)

Open books and notes. Write in the spaces provided. Be neat.

	Grade	*From*
Question 1		***9***
Question 2		***4***
Question 3		***7***
Total		***20***

Question 1 (9 points)

Consider the following network topology and the class **C** address **195.83.47.0/24**.



1) How many IP subnets do we have in the previous topology?

6 subnets

2) What is subnet mask for each subnet if we want to keep the number of hosts on each subnet to the maximum?

255.255.255.224 (/27)

3) What are the IP addresses of different subnets?

Subnet 1: 195.83.47.32/27
Subnet 2: 195.83.47.64/27
Subnet 3: 195.83.47.96/27
Subnet 4: 195.83.47.128/27
Subnet 5: 195.83.47.160/27
Subnet 6: 195.83.47.192/27

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4) What are the IP addresses of different routers?

R1 (Subnet 1): 195.83.47.33/27
R1 (Subnet 2): 195.83.47.65/27
R1 (Subnet 3): 195.83.47.97/27
R2 (Subnet 3): 195.83.47.98/27
R2 (Subnet 4): 195.83.47.129/27
R2 (Subnet 5): 195.83.47.161/27
R3 (Subnet 5): 195.83.47.162/27
R3 (Subnet 6): 195.83.47.193/27

5) What are the IP addresses of different hosts?

Host 1 (Subnet 1): 195.83.47.34/27
Host 2 (Subnet 2): 195.83.47.66/27
Host 3 (Subnet 4): 195.83.47.130/27
Host 4 (Subnet 6): 195.83.47.194/27

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6) How many IP addresses are required for Bridge **B1**?

No IP address is required for the bridge B1

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7) What are the broadcast IP addresses of different subnets?

Subnet 1: 195.83.47.63
Subnet 2: 195.83.47.95
Subnet 3: 195.83.47.127
Subnet 4: 195.83.47.159
Subnet 5: 195.83.47.191
Subnet 6: 195.83.47.223

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8) What are the lowest and highest IP addresses of different subnets?

Subnet 1: Lowest: 195.83.47.33, Highest: 195.83.47.62
Subnet 2: Lowest: 195.83.47.65, Highest: 195.83.47.94
Subnet 3: Lowest: 195.83.47.97, Highest: 195.83.47.126
Subnet 4: Lowest: 195.83.47.129, Highest: 195.83.47.158
Subnet 5: Lowest: 195.83.47.161, Highest: 195.83.47.190
Subnet 6: Lowest: 195.83.47.193, Highest: 195.83.47.222

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9) Give the content of Router **R1** routing table.

Destination	***Next-Hop***	***Cost***
195.83.47.32/27	***Connected***	***1***
195.83.47.64/27	***Connected***	***1***
195.83.47.96/27	***Connected***	***1***
195.83.47.128/27	***195.83.47.98***	***1***
195.83.47.16027	***195.83.47.98***	***1***
195.83.47.192/27	***195.83.47.98***	***1***

Question 2 (4 points)

The left table below shows the content of a non-optimized routing table. Using CIDR (Classless Inter-Domain Routing), give in the right table the new content of the routing table after aggregation.

Destination	**Next-Hop**
131.47.0.0/16	193.13.73.1
131.48.0.0/16	193.13.73.1
193.61.24.0/24	193.13.73.1
193.61.25.0/24	193.13.73.1
193.61.26.0/24	193.13.73.2
193.61.27.0/24	193.13.73.1
198.125.64.0/24	198.83.76.1
198.125.65.0/24	198.83.76.1
198.125.66.0/24	198.83.76.1
198.125.67.0/24	198.83.76.2
198.125.68.0/24	198.83.76.2
198.125.69.0/24	198.83.76.1
198.125.70.0/24	198.83.76.1
198.125.71.0/24	198.83.76.1

Destination	**Next-Hop**
131.47.0.0/16	***193.13.73.1***
131.48.0.0/16	***193.13.73.1***
193.61.24.0/22	***193.13.73.1***
193.61.26.0/24	***193.13.73.2***
198.125.64.0/21	***198.83.76.1***
198.125.67.0/24	***198.83.76.2***
198.125.68.0/24	***198.83.76.2***

Question 3 (7 points)

1) Is it possible to use static routing in a network that contains more than 16 routers? Argue your answer.

Yes, we can use static routing in a network that contains more than 16 routers, because there is no restriction in static routing.

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2) Is it possible to use the **RIP** routing protocol inside a network that contains more than 16 routers? Argue your answer.

Yes, we can use RIP in a network that contains more than 16 routers, because the limit of 16 routers in RIP is on the diameter of the network not on the number of routers in a network.

3) Explain why the **OSPF** routing protocol is more adequate than static routing and **RIP** for large networks?

OSPF is more adequate than static routing because it is tolerant to failure and require less effort from network administrator.

OSPF is more adequate than RIP for large networks because it has no limit on the diameter of the network and sends less control traffic and it is faster in convergence time.

4) What is the mechanism used by **OSPF** to scale to even extremely large networks and explain how this mechanism resolve this issue of scalability?

Hierarchical routing and the splitting of the routing domain to many areas is the mechanism used by OSPF to scale to extremely large networks.
By splitting the autonomous system to many areas we reduce the amount of traffic exchanged in each area and we reduce the topology database. Also local changes in a given area are hidden from other areas.

5) What is the purpose of Hello messages used in **OSPF**?

Discover neighbors and maintain adjacency between adjacent neighbors.

6) What is the maximum period of time required to detect the failure of an adjacent router in **OSPF**?

The maximum period of time required to detect the failure of an adjacent router in OSPF is the RouterDeadInterval which has the default value of 40 seconds.

7) In order to transport voice over IP, the network should provide a convergence time smaller than 50 milliseconds. What enhancements you propose to the current **OSPF** in order to provide such convergence time?

We should reduce the value of the RouterDeadInterval to be in less than 50 ms. So, we should send hello messages each 10 ms and declare a neighbor as dead in no Hello message is received during a period of 40 ms. So The enhancement is to change the time unit from seconds to milliseconds for HelloInterval and RouterDeadInterval.