During tutorials prepare a short report of your activities and show it to your tutor.
Study the following **questions** and verify the correctness of any **answers** given.
Be aware that the exam question might be directly related to the tutorial questions

Additional Instructions: Where a **group number** is indicated, please discuss this question with other members of your group, prepare a written answer to the question and then email this to your tutor (you may wish to verify the correctness of your answer first). This will be used to produce a set of sample answers for the class for study purposes. *Optional*: if you would like to share other answers with the class then feel free to do so.

Lecture 04 addendum tutorial:

Study the TCP Flow Graph that you obtained in Tutorial 4 (copy on Moodle) and answer the following questions:

1. Describe activities in frames 11, 13, 15
2. In the frame 32 why we have **Ack = 10043**
3. **Ack = 10043** has been repeated in many frames after the frame 32. What does it mean?
4. What is happening in the frame 86?
5. Are there any retransmissions occurring. In which frames?
6. Indicate frames related to the congestion control. What is happening after such frames have been received?

Lecture 05 tutorial: Network Layer. Part 1.

Study the following questions. Verify the correctness of the answers if given. Write the answers where required.

Group 6

Question 1.
What is the fundamental difference between a router and a (link-layer) switch?

Question 2.
What is the difference between routing and forwarding?

Group 7

Question 3.
Do routers have IP addresses? If yes, how many?

Question 4.
Suppose Host A sends Host B a TCP segment encapsulated in an IP packet. When Host B receives the packet, how does the network layer in Host B know it should pass the payload of the IP packet to TCP rather than to UDP or to something else?

Group 8

Question 5.
Explain the meaning of the following fields in the IPv4 header:

a. Total Length (TL)
b. Time to Live (TTL)

Question 6.
What does the Internet Corporation for Assigned Names and Numbers (ICANN) do?

Group 9

Question 7.
What is CIDR? What does **120.12.20.0/22** mean?

Group 10

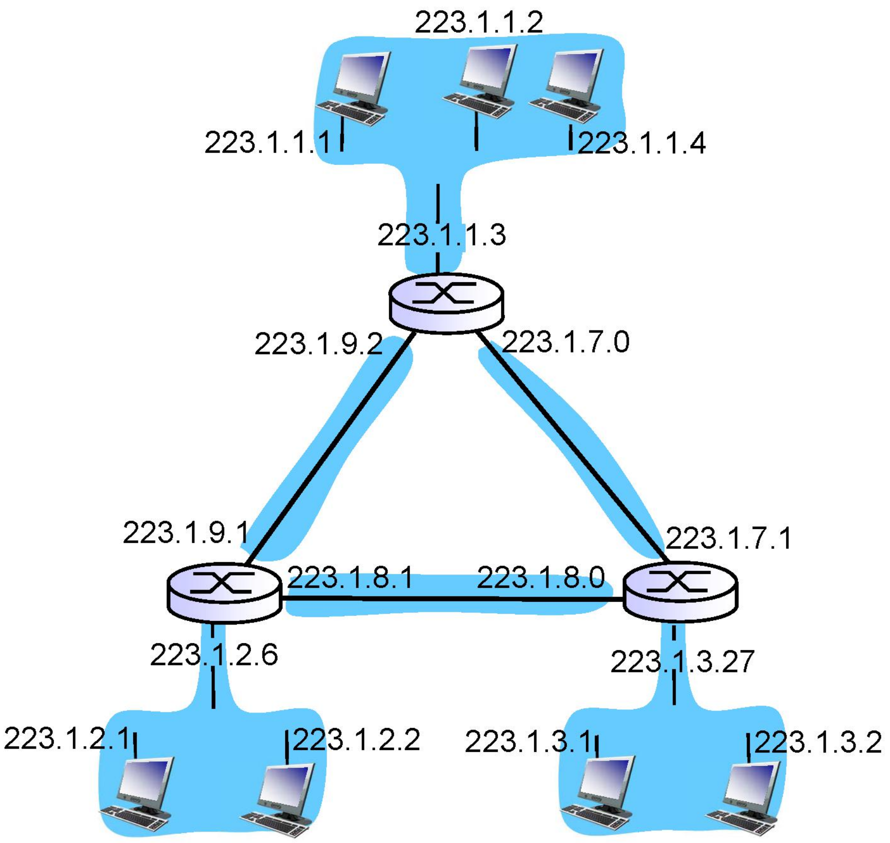
Question 8.
Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix `223.1.17.0/24`. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form `a.b.c.d/x`) that satisfy these constraints.

Group 1

Question 9.
Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119 .40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

All: Please study the question and verify the correctness of the answer

Question 10.
Consider the network **topology** shown in Slide 28:



Denote the three subnets **with hosts** (starting clockwise at 12:00) as Networks A, B, and C. Denote the subnets **without hosts** as Networks D, E, and F.

a) Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b.c.d/x or a.b.c.d/x - e.f.g.h/y.

b) Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers

A

From 214.97.254/23, possible assignments are

a) Subnet A: 214.97.255/24 (256 addresses)
Subnet B: 214.97.254.0/25 - 214.97.254.0/29 (128-8 = 120 addresses)
Subnet C: 214.97.254.128/25 (128 addresses)

Subnet D: 214.97.254.0/31 (2 addresses)
Subnet E: 214.97.254.2/31 (2 addresses)
Subnet F: 214.97.254.4/30 (4 addresses)

b) To simplify the solution, assume that no datagrams have router interfaces as ultimate destinations. Also, label D, E, F for the upper-right, bottom, and upper-left interior subnets, respectively.

Router 1

Longest Prefix Match	**Outgoing Interface**
11010110 01100001 11111111	Subnet A
11010110 01100001 11111110 0000000	Subnet D
11010110 01100001 11111110 000001	Subnet F

Router 2

Longest Prefix Match	**Outgoing Interface**
11010110 01100001 11111111 0000000	Subnet D
11010110 01100001 11111110 0	Subnet B
11010110 01100001 11111110 0000001	Subnet E

Group 2

Question 11.
What are the

a. Private networks addresses,
b. Link-local addresses

Where are they used?

Group 3

Question 12.
Describe the DHCP protocol. Use an example to demonstrate the main steps of the protocol

Group 4

Question 13.
Where are the DNS root servers?

Hint: *Go* to: **http://root-servers.org** and **http://www.iana.org/domains/root/servers**
and compile a short answer

All: practice the following

Question 14.
Open the command window and practice using **nslookup** command

e.g.

```
app> nslookup  zz.cn
Server:  ns1.its.monash.edu.au
Address:  130.194.1.99

Non-authoritative answer:
Name:    zz.cn
Address:  211.100.61.67
```

Group 5

Question 15.
Assume that you try to access **vic.gov.au** and your local DNS server does not know the IP address. Draw diagrams similar to that in slides 42, 43 and 44 to demonstrate how the name resolution works using both the **iterated** and **recursive** query.

Wireshark: DHCP Experiment (optional)

In order to observe DHCP in action, we'll perform several DHCP-related commands and capture the DHCP messages exchanged as a result of executing these commands. Do the following:

1. Begin by opening the Windows Command Prompt application (which can be found in your Accessories folder). Enter "*ipconfig /release*". This command releases your current IP address, so that your host's IP address becomes : 0.0.0.0
2. Start up the Wireshark and begin packet capture.
3. Now go back to the Windows Command Prompt and enter "*ipconfig /renew*". This instructs your host to obtain a network configuration, including a new IP address e.g. 192.168.1.108
4. Wait until the "*ipconfig /renew*" has terminated. Then enter the same command "*ipconfig /renew*" again.
5. When the second *"ipconfig /renew"* terminates, enter the command "ipconfig/release" to release the previously-allocated IP address to your computer.
6. Finally, enter "*ipconfig /renew*" to again be allocated an IP address for your computer.
7. Stop Wireshark packet capture.

If you have problems with the recording the above wireshark traces, you can use pre-recorded **dhcp-ethereal-trace-1.pcap** available on Moodle.

Now let's take a look at the resulting Wireshark window. To see only the DHCP packets, enter into the filter field "bootp". (DHCP derives from an older protocol called BOOTP. Both BOOTP and DHCP use the same port numbers, 67 and 68. To see DHCP packets in the current version of Wireshark, you need to enter "bootp" and not "dhcp" in the filter.) We can see that the first *ipconfig* renew command caused four DHCP packets to be generated: a

DHCP Discover packet, a DHCP Offer packet, a DHCP Request packet, and a DHCP ACK packet.

Answer the following questions:

1. Are DHCP messages sent over UDP or TCP?
2. Draw a timing datagram illustrating the sequence of the first four-packet Discover/Offer/Request/ACK DHCP exchange between the client and server. For each packet, indicated the source and destination port numbers. Are the port numbers the same as in the example given in this lab assignment?
3. What is the link-layer (e.g., Ethernet) address of your host?
4. What values in the DHCP discover message differentiate this message from the DHCP request message?
5. What is the value of the Transaction-ID in each of the first four (Discover/Offer/Request/ACK) DHCP messages? What are the values of the Transaction-ID in the second set (Request/ACK) set of DHCP messages? What is the purpose of the Transaction-ID field?
6. A host uses DHCP to obtain an IP address, among other things. But a host's IP address is not confirmed until the end of the four-message exchange! If the IP address is not set until the end of the four-message exchange, then what values are used in the IP datagrams in the four-message exchange? For each of the four DHCP messages (Discover/Offer/Request/ACK DHCP), indicate the source and destination IP addresses that are carried in the encapsulating IP datagram.
7. What is the IP address of your DHCP server?
8. What IP address is the DHCP server offering to your host in the DHCP Offer message? Indicate which DHCP message contains the offered DHCP address.
9. In the example screenshot in this assignment, there is no relay agent between the host and the DHCP server. What values in the trace indicate the absence of a relay agent? Is there a relay agent in your experiment? If so what is the IP address of the agent?
10. Explain the purpose of the router and subnet mask lines in the DHCP offer message.
11. In the DHCP trace file noted in footnote 2, the DHCP server offers a specific IP address to the client (see also question 8. above). In the client's response to the first server OFFER message, does the client accept this IP address? Where in the client's RESPONSE is the client's requested address?
12. Explain the purpose of the lease time. How long is the lease time in your experiment?
13. What is the purpose of the DHCP release message? Does the DHCP server issue an acknowledgment of receipt of the client's DHCP request? What would happen if the client's DHCP release message is lost?
14. Clear the *bootp* filter from your Wireshark window. Were any ARP packets sent or received during the DHCP packet-exchange period? If so, explain the purpose of those ARP packets