Name……..…ID……..……..Section…….……Seat No……..….

Sirindhorn International Institute of Technology
Thammasat University

Midterm Examination: Semester 2/2006

Course Title : ITS 332 Information Technology II Lab (Networking)

Instructor : Dr Steven Gordon

Date/Time : Wednesday 10 January 2007 9:00 – 12:00

Instructions:

- This examination paper has 14 pages (including this page).
- Condition of Examination
  Closed book (No dictionary, No calculator allowed)
- Students are not allowed to be out of the exam room during examination. Going to the restroom may result in score deduction.
- Turn off all communication devices (mobile phone etc.) and leave them under your seat.
- Write your name, student ID, section, and seat number clearly on the answer sheet.
- The space on the back of each page can be used if necessary.

Answers

Part A – Multiple Choice [20 marks]

Select the most accurate answer. Only select one answer. Each question is worth 2 marks.

1. Ethernet is a network technology most commonly used for:
   a) Connecting two routers across wide area networks
   b) Connecting computers in a local area network
   c) Connecting web browsers to web servers
   d) Connecting Ethereal clients to web servers

2. A subnet mask
   a) Indicates the default router that a computer will send packets to
   b) Is 48-bits in length
   c) Can be used to determine which bits in an IP address refer to the host address
   d) Is always automatically created based on the IP address of your computer
   e) Is obtained by your computer using DNS

3. Which command is used to view the Internet configuration of your Windows XP computer?
   a) tracert
   b) ping
   c) arp
   d) ipconfig
   e) ftp
   f) cmd

4. Which address is an example of a broadcast address for a Class B network with a default subnet mask?
   a) 147.1.1.1
   b) 147.13.0.0
   c) 147.14.255.0
   d) 147.14.255.1
   e) 147.14.255.255

5. How many useable host addresses are available on a Class C network with a default subnet mask?
   a) 128
   b) 254
   c) 255
   d) 256
   e) 257

6. A MAC (or hardware or physical) address
   a) should be unique for each network device
   b) is set when you set the IP address on your computer
   c) can be found using DNS
   d) is assigned to your computer by the network administrator
   e) can be written in a human readable form as a URL

Answers

7. What is the purpose of the TCP three-way handshake?
    a) To obtain the destination IP address of the server
    b) To verify the source and destination IP addresses
    c) To synchronize sequence numbers prior to data transmission
    d) To determine the number of bytes that will be sent to the server
    e) To agree upon the speed at which data will be sent between source and destination

8. If you can ping a computer on your local network, but cannot ping a web server (e.g. `www.google.com`) on the Internet, a possible explanation is:
    a) You computer is using a crossover cable to connect to a switch, instead of a straight through cable
    b) The hardware/physical address used by your network interface card is incorrect
    c) Your network interface card is disabled
    d) Your computer does not allow ping messages to be sent
    e) Your local network router does not allow ping messages to be sent

9. The IP address of your computer
    a) Is always assigned manually by the network administrator
    b) Can be converted to a MAC (physical/hardware) address using DNS
    c) Can be automatically set using DNS
    d) Should have the same network portion as other computers on your LAN
    e) Is permanent (for example, never changes)

10. The default gateway for your computer
    a) Cannot be set using DHCP
    b) Indicates the host address of your computer
    c) Will always automatically configure the IP address of your computer
    d) Cannot be set manually (by you)
    e) Indicates the router that your packets will be sent to, if no other routes are known

Answers

Part B – General Questions [65 marks]

Question 1 [4 marks]

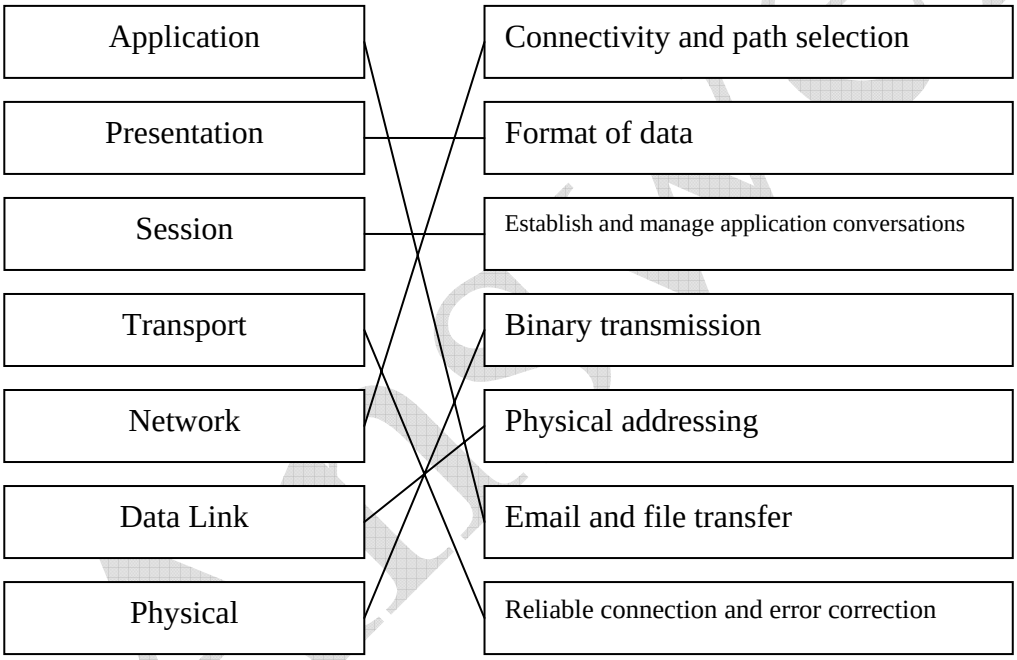
Name two types of addresses used in computer networks. For each type, give an example *or* brief description of the format.

Answers:
MAC (or physical or hardware) addresses. 48-bit address usually shown in hexadecimal

IP address. 32-bit address, e.g. 192.168.0.1 (dotted decimal representation)

Question 2 [5 marks]

a) Match the layers of the OSI model to the appropriate description or function.
b) For each of the application, transport and network layers, give an example protocol used at that layer.



Examples:
Application: HTTP, SMTP, FTP, …
Transport: TC, UDP, SCTP
Network: IP, ICMP

Answers

Question 3 [6 marks]

Selecting from the list of protocols, for each sentence write the protocol name that most accurately completes the sentence. The protocols you can select from are:

1. Address Resolution Protocol (ARP)
2. Carrier Sense Multiple Access (CSMA)
3. Dynamic Host Configuration Protocol (DHCP)
4. Domain Name System (DNS)
5. File Transfer Protocol (FTP)
6. HyperText Transfer Protocol (HTTP)
7. Internet Control Message Protocol (ICMP)
8. Internet Protocol (IP)
9. Transmission Control Protocol (TCP)
10. User Datagram Protocol (UDP)

Complete these sentences with the above protocols (write the acronym, for example "IP", in the space provided):

a) **DHCP**____ is used to automatically assign IP addresses to hosts in a network.
b) **DNS**_____ maps human readable URLs to IP addresses.
c) **HTTP**____ is used to transfer web pages from server to browser
d) **ARP**_____ maps IP addresses to hardware (MAC) addresses.
e) **ICMP (or IP or UDP)** is used by *ping* to check for network connectivity.
f) **TCP**_____ provides reliable data delivery in the Internet

Question 4 [12 marks]

The following page contains output from an Ethereal trace, run on the computer `192.168.1.2`. The first section shows the summary of all (9) captured packets. Below that are the details of selected packets. Based on the captured data shown, answer the following questions:

a) What activity is captured in this trace (in other words, what did the user do while Ethereal was capturing packets)?

A user is browsing to a website

b) What is the purpose of packet No. 1? Why was it sent to the destination `203.113.15.100`?

To find the IP address for the URL sandilands.info. 203.113.15.100 is a DNS server.

c) What is the purpose of packets 3, 4 and 5? Your answer should include a description of what the packet types mean (SYN and ACK) and what the parameters Seq and Ack mean.

TCP 3 way handshake:
SYN is to synchronize sequence numbers
ACK is to acknowledge (agree upon) the sequence number proposed
Seq is the number proposed to start with (refers to bytes)
Ack indicates the next byte expected

d) Do you know the physical (hardware/MAC) address of the computer that Ethereal is run on? If yes, what is it?

Yes. 00:17:31:7e:50:7d

Answers

e) Do you know the physical (hardware/MAC) address of the web server? If yes, what is it?

No.

f) What information does packet 8 carry?

The actual web page requested.

g) What does the value of the Ack field in packet (frame) 8 indicate?

The next byte expected has sequence number 469.

Answers

```
No. Time       Source           Destination      Protocol Info
1   0.000000   192.168.1.2      203.113.15.100   DNS      Standard query A sandilands.info
2   0.392565   203.113.15.100   192.168.1.2      DNS      Standard query response A 125.25.208.135
3   0.393106   192.168.1.2      125.25.208.135   TCP      3750 > http [SYN] Seq=0 Len=0 MSS=1460
4   0.396030   125.25.208.135   192.168.1.2      TCP      http > 3750 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460
5   0.396045   192.168.1.2      125.25.208.135   TCP      3750 > http [ACK] Seq=1 Ack=1 Win=65535 Len=0
6   0.396111   192.168.1.2      125.25.208.135   HTTP     GET /test.html HTTP/1.1
7   0.399716   125.25.208.135   192.168.1.2      TCP      http > 3750 [ACK] Seq=1 Ack=469 Win=6432 Len=0
8   0.400839   125.25.208.135   192.168.1.2      HTTP     HTTP/1.1 200 OK (text/html)
9   0.725801   192.168.1.2      125.25.208.135   TCP      3750 > http [ACK] Seq=469 Ack=1417 Win=64119 Len=0

Frame 6 (522 bytes on wire, 522 bytes captured)
Ethernet II, Src: AsustekC_7e:50:7d (00:17:31:7e:50:7d), Dst: ZyxelCom_6c:e3:b3 (00:13:49:6c:e3:b3)
Internet Protocol, Src: 192.168.1.2 (192.168.1.2), Dst: 125.25.208.135 (125.25.208.135)
Transmission Control Protocol, Src Port: 3750 (3750), Dst Port: http (80), Seq: 1, Ack: 1, Len: 468
Hypertext Transfer Protocol

Frame 8 (1470 bytes on wire, 1470 bytes captured)
Ethernet II, Src: ZyxelCom_6c:e3:b3 (00:13:49:6c:e3:b3), Dst: AsustekC_7e:50:7d (00:17:31:7e:50:7d)
Internet Protocol, Src: 125.25.208.135 (125.25.208.135), Dst: 192.168.1.2 (192.168.1.2)
Transmission Control Protocol, Src Port: http (80), Dst Port: 3750 (3750), Seq: 1, Ack: 469, Len: 1416
Hypertext Transfer Protocol
Line-based text data: text/html
```

Answers

Question 5 [16 marks]

The following is output from running several applications (commands) on a computer on the Internet. Based on the output, answer the questions below.

```
C:\Documents and Settings\Steve>ipconfig /all

Windows IP Configuration

        Host Name . . . . . . . . . . . . : win06v6
        Primary Dns Suffix  . . . . . . . :
        Node Type . . . . . . . . . . . . : Unknown
        IP Routing Enabled. . . . . . . . : No
        WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        Description . . . . . . . . . . . : Realtek RTL8168/8111 PCI-E Gigabit
Ethernet NIC
        Physical Address. . . . . . . . . : 00-17-31-7E-50-7D
        Dhcp Enabled. . . . . . . . . . . : No
        IP Address. . . . . . . . . . . . : 192.168.1.2
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.1.1
        DNS Servers . . . . . . . . . . . : 203.113.15.99
                                            203.113.15.100

C:\Documents and Settings\Steve>ping www.google.co.th

Pinging www.l.google.com [66.249.89.99] with 32 bytes of data:

Reply from 66.249.89.99: bytes=32 time=194ms TTL=237
Reply from 66.249.89.99: bytes=32 time=192ms TTL=237
Reply from 66.249.89.99: bytes=32 time=194ms TTL=237
Reply from 66.249.89.99: bytes=32 time=191ms TTL=237

Ping statistics for 66.249.89.99:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 191ms, Maximum = 194ms, Average = 192ms


C:\Documents and Settings\Steve>ping www.google.com

Pinging www.l.google.com [66.249.89.99] with 32 bytes of data:

Reply from 66.249.89.99: bytes=32 time=190ms TTL=237
Reply from 66.249.89.99: bytes=32 time=194ms TTL=237
Reply from 66.249.89.99: bytes=32 time=193ms TTL=237
Reply from 66.249.89.99: bytes=32 time=192ms TTL=237

Ping statistics for 66.249.89.99:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 190ms, Maximum = 194ms, Average = 192ms

C:\Documents and Settings\Steve>ping www.siit.tu.ac.th

Pinging www.siit.tu.ac.th [203.131.209.77] with 32 bytes of data:
```

Answers

```
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 203.131.209.77:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings\Steve>arp -a

Interface: 192.168.1.2 --- 0x2
  Internet Address      Physical Address      Type
  192.168.1.1           00-13-49-6c-e3-b3     dynamic

C:\Documents and Settings\Steve>tracert www.google.co.th

Tracing route to www.l.google.com [66.249.89.99]
over a maximum of 30 hops:

  1     2 ms     2 ms     2 ms  lime [192.168.1.1]
  2    27 ms    27 ms    23 ms  125-25-208-1.adsl.totbb.net [125.25.208.1]
  3    26 ms    24 ms    23 ms  192.168.0.133
  4    24 ms    25 ms    27 ms  203.113.13.45
  5    26 ms    23 ms    27 ms  ge1-2.gw1-kkm.totisp.net [203.113.13.9]
  6    38 ms    26 ms    29 ms  203.190.250.129
  7    26 ms    24 ms    24 ms  203.190.250.41
  8   846 ms   845 ms   843 ms  203.131.241.129
  9   880 ms   877 ms   878 ms  ge-2-2-0.r01.newthk01.hk.bb.gin.ntt.net
                                  [203.131.240.209]
 10   555 ms   553 ms   556 ms  p16-0-2-3.r21.tokyjp01.jp.bb.gin.ntt.net
                                  [129.250.2.233]
 11   195 ms   193 ms   193 ms  203.192.129.53
 12   191 ms   192 ms   190 ms  gi1-0.gw1.nrt4.asianetcom.net [202.147.1.117]
 13   193 ms   193 ms     *     gi1-0.gw1.nrt4.asianetcom.net [202.147.1.117]
 14   193 ms   192 ms   193 ms  GoogleInc.gw1.nrt4.asianetcom.net [203.192.131.70]
 15   202 ms   199 ms   197 ms  216.239.47.54
 16   192 ms   193 ms   192 ms  66.249.89.99

Trace complete.

C:\Documents and Settings\Steve>
```

a) How many network interfaces (e.g. LAN cards) does the computer have?

1

b) What is the IP address of this computer (that is, the computer on which the commands were run)?

192.168.1.2

c) Are there any other computers on the local area network of this computer? If so, what are their IP addresses?

Yes. 192.168.1.1

d) What is the average time it takes to send a packet *to* www.google.co.th?

Answers

96ms

e) If you executed the command `ping 66.249.89.104`, and compared the results with those from the ping to `www.google.co.th`, what would you expect to see? Explain your answer.

NOTE: This question has a mistake. The IP address should have been 66.249.89.99. Every one was given 2 marks for this question, no matter what they answered.

f) What does the ping to `www.google.com` indicate (when compared to the ping to `www.google.co.th`)?

www.google.com is redirected to www.google.co.th (or www.google.com and www.google.co.th are hosted on the same server).

g) What does the ping to `www.siit.tu.ac.th` indicate? Give a possible reason as to why the results may have been obtained.

Cannot connect to www.siit.tu.ac.th. Possible reasons include:
Server is down
Firewall at local network doesn't allow pings
Server doesn't respond to pings
No path to server
…

h) Name two protocols that are used when executing the ping commands.

ICMP, DNS, IP

i) How many routers are between this computer and the `www.google.co.th` server?

15

j) What is the round trip time between this computer and `203.131.241.129`?

846ms

k) How does the round trip time with `203.131.241.129` compare with that of the `www.google.co.th` server? Comment on, and explain the difference.

Larger round trip time to intermediate server may be due to network congestion at that time, or slow response from 203.131.241.129. Or the ping goes on a different (slower) path.

Answers

Question 6 [7 marks]

Assume you want to configure a peer-to-peer network between two computers at home.

a) If computer A has an IP address of 192.168.1.34 and subnet mask of 255.255.255.0, are the following addresses necessary? If yes, then what should they be set to?
   i. IP address

192.168.1.x where x is 1 to 254

   ii. Subnet mask

255.255.255.0

   iii. Default gateway

Not needed.

Note that the above question was unclear in that it did not specify computer B. I was very lenient in marking this part.

b) What type of cable would you use to connect the two computers?

Crossover.

c) How could you test if your have correctly connected and configured the two computers?

Ping from A to B.

Question 7 [15 marks]

The figure on page 13 shows a computer network with 3 computers, 3 routers and 1 switch. Each device is labelled with a unique letter (A to G), and the network interface (IF) of each device is labelled with a number (e.g. IF1, IF2). E2 refers to interface (IF) 2 on device E (a router). From the figure, answer the following questions.

a) What type of cable should you use to connect:
   a. Computer A to Switch D

Straight through

   b. Switch D to Router E

Straight through

   c. Router E to Router F

Answers

Serial

d. Router G to Computer C

Crossover

b) How many different IP networks are used?

4

c) Complete the following table showing the interface configurations:

Device	**Interface**	**IP address**	**Subnet mask**	**Default gateway**
Computer A	IF1	192.168.3.7	255.255.255.0	192.168.3.2
Computer B	IF1	**192.168.3.x**	**255.255.255.0**	**192.168.3.2**
Computer C	IF1	**200.1.2.y**	**255.255.255.0**	**200.1.2.1**
Router E	IF1	**192.168.3.2**	**255.255.255.0**	not applicable
	IF2	**a.b**	255.255.0.0	not applicable
Router F	IF1	**a.c**	**255.255.0.0**	not applicable
	IF2	**172.16.z**	**255.255.0.0**	not applicable
Router G	IF1	172.16.12.1	255.255.0.0	not applicable
	IF2	200.1.2.1	255.255.255.0	not applicable

d) Based on the addresses configured in part (c), complete the routing tables for each router (hint: the "Next Router" for the first entry of Router E will be the IP address of IF1 on Router F):

Router E

Destination Network	**Destination Subnet Mask**	**Next Router**
200.1.2.0	255.255.255.0	**a.c**
172.16.0.0	255.255.0.0	**a.c**

Answers

Router F

Destination Network	Destination Subnet Mask	Next Router
200.1.2.0	255.255.255.0	172.16.12.1
192.168.3.0	255.255.255.0	**a.b**

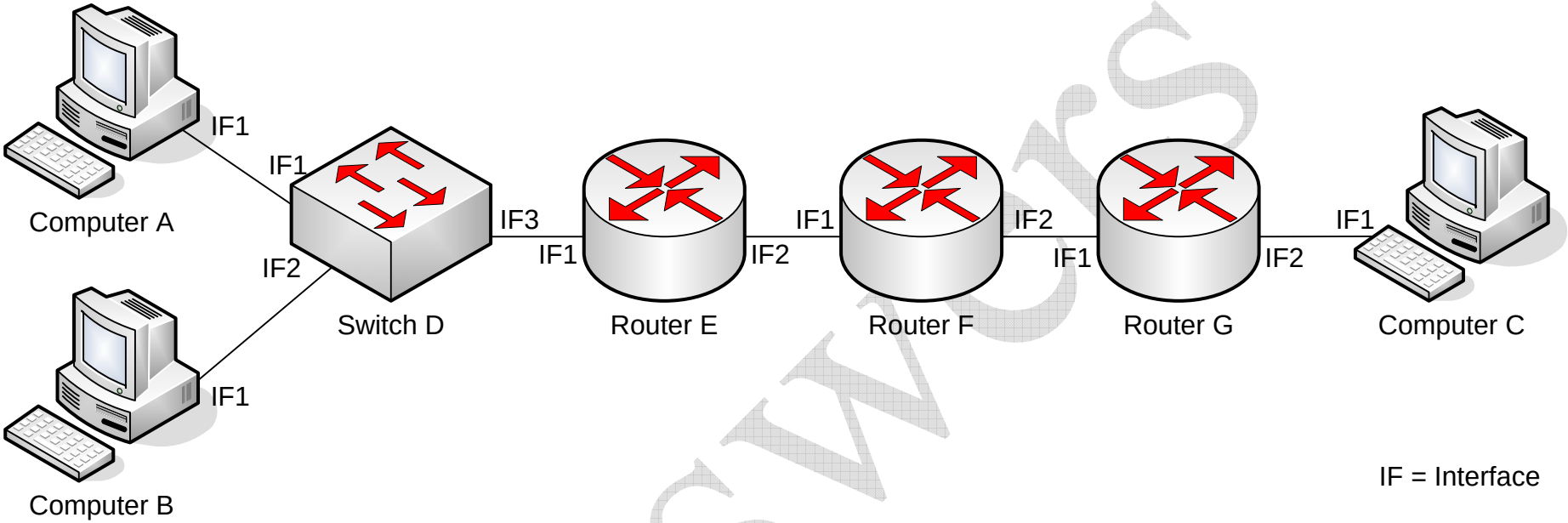
Router G

Destination Network	Destination Subnet Mask	Next Router
192.168.3.0	255.255.255.0	**172.16.z**
a.0.0	**255.255.0.0**	**172.16.z**

Explanation:
In this question you could give different possible IP addresses as answers in some cases. I have shown them as a.b, a.z, x, y etc.
a.b means a is the network portion of the address and b is the host portion. Example addresses could be: x=3, y=2, a=172.15, b=1.1, c=1.2 and z=12.2.

Answers

Figure for Question 7



Answers

Answers