UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2012/2013 – 2nd Year Examination – Semester 4

IT4504: Data Communication and Networks
PART 2 - Structured Question Paper

21st July, 2013
(ONE HOUR)

To be completed by the candidate

BIT Examination Index No: ....

Important Instructions:

- The duration of the paper is **1 (One) hour**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **8 pages**.
- **Answer all questions.** All questions carry equal marks.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.

Questions Answered

Indicate by a cross (✗), (e.g. ✗) the numbers of the questions answered.

To be completed by the candidate by marking a cross (✗).	Question numbers			
	1	2	3	4
To be completed by the examiners:				

(1)

(i)   Your Internet Service Provider has given you the following information regarding your office data link.

- Link type local loop with 128Kbps fixed bandwidth in both directions.
- LAN interface - IP 192.248.19.20
- Subnet - 255.255.255.240

(a) What is the network address /subnet ID?

(2 marks)

192.248.19.16

(b) What is the broadcast address for the specified subnet?

(2 marks)

192.248.19.31

(c) How many usable IP numbers are available for your equipment?

(2 marks)

14

(d) What ID is the above router Interface IP in Classless Inter-Domain Routing (CIDR) notation?

(2 marks)

192.248.19.20/28

(ii)   State the technologies that are available to provide internet facilities to the office staff if 50 computers are using the above link.

(5 marks)

Using NAT /PAT or proxy

(iii) If the office is using VoIP technology as a replacement for its internal PABX (intercom) facilities, state a technology by using which, you can provide a guaranteed bandwidth for internal voice applications. Explain briefly how you can implement your technical solution.

(12 marks)

Use QOS and provide separate priority for voice and other data on the

networking devices(switch, routers etc) , or implement separate network

segment for voice and isolate the resources.

2)

(i) If you have to convert a sound signal having a frequency range between 1KHz to 8KHz, to a digital signal, calculate the required minimum sampling rate that will enable you to recover the original signal later.

(5 marks)

8000 X 2

=16000 samples per sec

(ii) Calculate the maximum permissible propagation delay for a shared Ethernet that sends packets of 32Kbits at 64Mbps.

(10 marks)

> T=32 000 /(2 X64 000000)
>
> 1/4000=0.00025 sec

(iii) Calculate the maximum data rate over a noisy channel that has a liner S/N of 31 and a bandwidth of 200Khz.

(10 marks)

> $=200,000Hz(\log_2(1+31))$
>
> $=200000X5$
>
> $=1000,000$
>
> $=1Mbps$

(3) Suppose you have got an ADSL link with one static IP for your office to serve 20 computers.

(i) What basic equipment (active components) will you require for the network to be setup? Explain the connectivity in the form of a basic diagram.

(15 marks)

ADSL Router,

Switchers,Splitter

ADSL Line

Splitter

ADSL Router

telephone

Network Switch
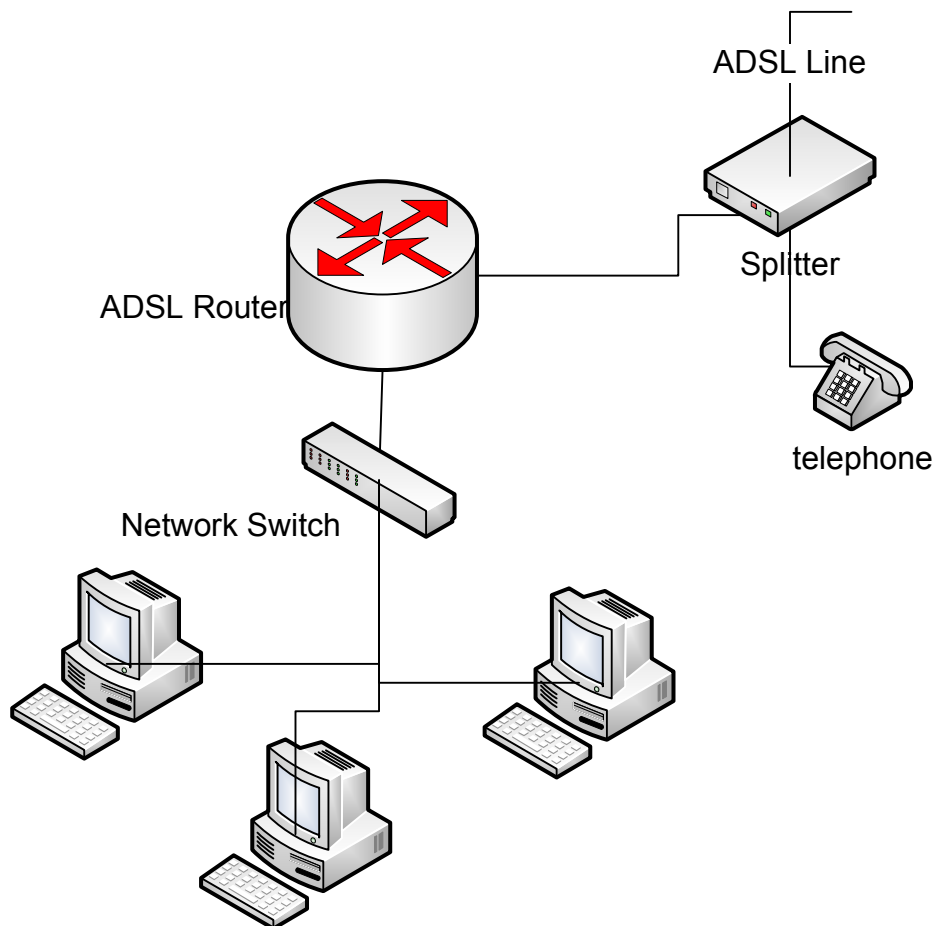
(ii) If the office has a wireless environment, explain how you can secure the WiFi access point to restrict the connectivity to two Laptops used by top management.

(5 marks)

> The MAC address filtering needs to be enabled on the access point. The MAC address
>
> of the WIFI card of the two computers needs to be entered to the allow list on the
>
> access point.

(ii) State an alternative way to secure your WiFi to enable only a selected user to be connected to it without making restriction on the device.

(5 marks)

> Enabling passwords
>
> Captive Portal
>
> hide the SSID so only selected users know the SSID

4
(i) Explain briefly the difference between IPv4 loopback address, network address and the broadcast address giving examples.

(9 marks)

> Loopback address is used by the every host to address itself and it is a special reserved
> address having an IP range 127.0.0.1-127 subnet 255.255.255.255
>
> Network address is reserved to identify a network where all host segment is having 0. Eg
> .192.248.16.0 is the network address for a network having host ip address from 192.248.16.1-254.

Broadcast address is reserved to send broadcast messages in a network   the address is consist of all 1 for the host component eg

192.248.16.255 is the network address for a network having host ip address from 192.248.16.1-254.

(ii) Explain the difference between adaptive and non-adaptive routing algorithms.

(6 marks)

Non-adaptive algorithms do not base their routing decisions on measurements or estimates of the current traffic and topology, referred to as static routing

Adaptive Algorithms change their routing decisions to reflect changes in the traffic and the topology used, referred to as dynamic routing

(iii) A three-way handshake is used to establish a TCP connection. Explain the main stages of the

three-way handshake.

(6 marks)

(1) ACTIVE OPEN: Client sends a segment with SYN bit set , port number of client ,initial sequence number (ISN) of client
(2) PASSIVE OPEN: Server responds with a segment with SYN bit set , initial sequence number of server, ACK for ISN of client
3) Client acknowledges by sending a segment with ACK ISN of server

(iv) Explain a firewall and highlight the 4 main generations of firewalls.

(4 marks)

Firewall is a device or set of devices designed to permit or deny network transmissions based upon a set of rules.
First generation: They are packet filters which work mainly on the first three layers of the OSI reference model. It can filter on source or destination IP and port based rules
Second generation: They are application layer filters . IT works on all seven layers of the OSI model. Can filter based on content.
Third generation: they are "stateful" filter. it works on all seven layers of the OSI model.Can filter based on content and keep track of the connection
Forth generation :Dynamic Packet Filters . Works similar to others but rules are modified on the fly. This also called as active defense systems

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