



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2013/2014 – 2nd Year Examination – Semester 4

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

20st July, 2014
(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 **3 questions** and **8 pages**.
- **Answer all questions.** All questions **do not** 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 (x), (e.g.

X

) the numbers of the questions answered.

	Question numbers			
	1	2	3	
To be completed by the candidate by marking a cross (x).				
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 & bandwidth -Local Leased Circuit with 10Mbps fixed bandwidth in both directions.
- LAN interface of the router - IP 192.248.22.20 (public IP)
- Subnet - 255.255.255.224



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

(1 marks)

192.248.22.0

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

(1 marks)

192.248.22.31

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

(1 marks)

30

(d) Write down IP of the above router interface in Classless Inter-Domain Routing (CIDR) notation?

(1 marks)

192.248.22.20/27

(ii)

State the technologies that are available to provide world wide web (web browsing)facilities to the rest of the office if you have 150 staff computers.

(4 marks)

Using NAT /PAT or web proxy

- (iii) The office wants to maintain a video conferencing facility to communicate with overseas partners. How do you provide dedicated bandwidth /data rate to the video conferencing data packets within your network? Explain briefly how you can implement your technical solution.

(12 marks)

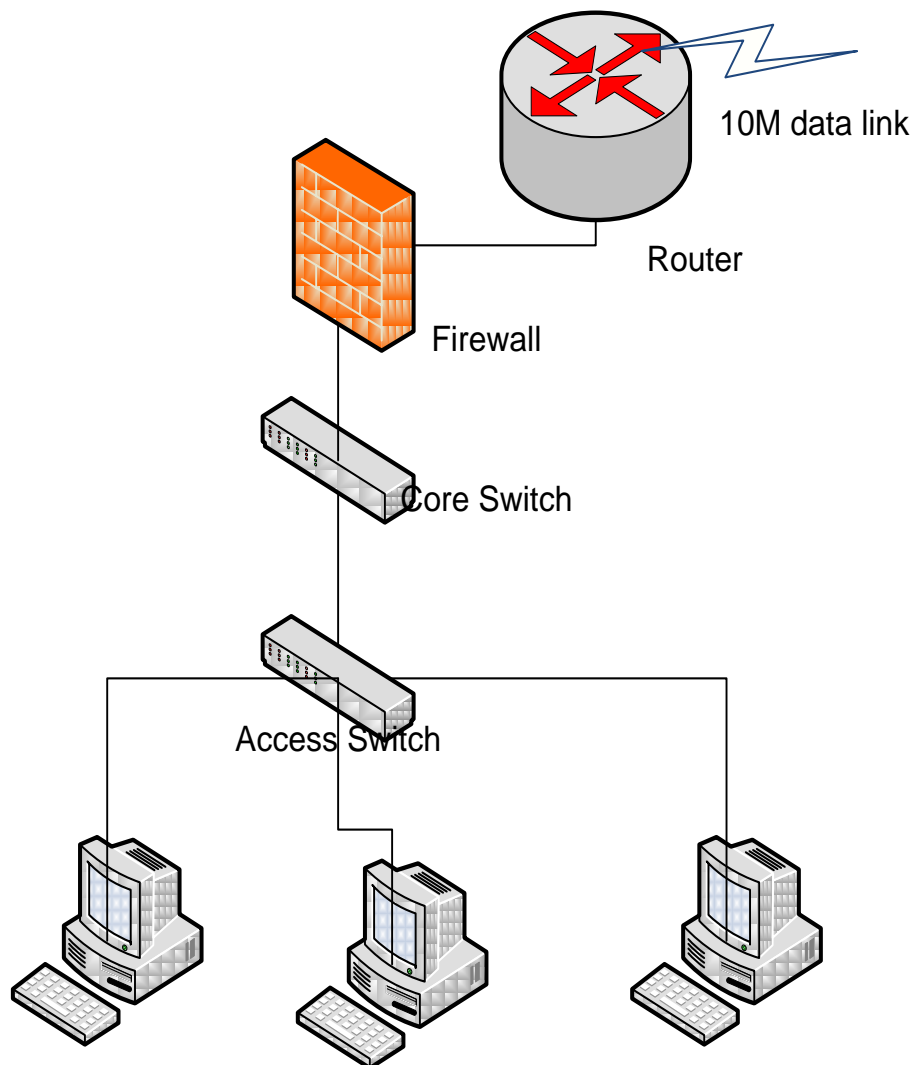
Use QOS and provide separate priority for VC connection on all end and intermediate networking devices (switch, routers etc) are separate VLAN Must be implemented for VC connectivity.

- iv) You have 3 separate departments (Accounts, Human Resources, Sales) in the office. How do you segregate the departments logically? State a technology that can be used for this purpose.

(10 marks)

Implement separate VLANs, Isolate the network using firewall or using ACL

- v) What are the basic equipments (active components) required for the above network? Use a diagram to depict the connectivity between those components.

(16 marks)**Router****Switch L1/L2 Core and Access switch****Firewall**

- (vi) The office also requires a wireless environment. State two technologies you can deploy to improve the security of this wireless LAN.

(4 marks)

The MAC address filtering , WEP, hiding SSID, Static IP assigning

end to end encryptions or VPN, implement security protocol like WPA,

WPA2,TKIP,EAP,

use of Smart cards, USB tokens, and software tokens, WAPI, RF Shielding

2)

- (i) 20,000 samples per second are captured during a digitising process of an analogue signal. What is the maximum frequency of the analogue signal you can reconstruct, theoretically, from these samples?

(5 marks)

20000 / 2

=10,000

=10Khz

- (ii) Calculate the maximum possible data rate over a noisy channel with an S/N ratio of 15 and a bandwidth of 20Khz.

(10 marks)

$$=20,000\text{Hz}(\log_2(1+15))$$

$$=20000 \times 4$$

$$=80,000$$

$$=80\text{Kbps}$$

- (iii) Briefly explain two key factors you will consider in selecting a suitable network topology/design for a networking project.

(10 marks)

Reliability

What is the degree of reliability expected? What is the permissible downtime, is the solution needs failover options?

Expandability

Does the system need to be expandable? What are the limitations of the required solution? The degree of complexity of adding extra nodes to the solution.

performance

Speed ,bandwidth, delay or latency need to be Considered under performance.

(3)

(i) What is a basic packet filtering firewall? Briefly explain its operations.

(5 marks)

The packet filtering firewall is a filter which filtered data packets using source or destination IP Address or port ID. This will require a layer 3 device to inspect the header of each data packet.

(ii) What is a VPN (Virtual Private Network) ? Explain briefly how it improves security.

(5 marks)

VPN is a secure network over public infrastructure using encryption technology. By setting up a VPN, we can establish a secure channel preventing a man in the middle type attack.

- (iii) What is a broadcast domain with respect to networks?

(5 marks)

A broadcast domain is a logical division of a computer network, in which all nodes can reach each other by broadcast at the data link layer.

- (iv) Explain briefly the advantages and disadvantages of modern ring networks

(5 marks)

Advantages, less cost on materials, Multipath circuits redundancy can be maintain

Disadvantages, Costly end equipment, shared bandwidth

- (v) Draw a diagram to show the messages passed between client and the DHCP server in establishing an IP address using the DHCP protocol.

(5 marks)

