



**UNIVERSITY OF COLOMBO, SRI LANKA**

**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**

**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**

**Academic Year 2013/2014 – 2<sup>nd</sup> Year Examination – Semester 4**

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

**20<sup>st</sup> 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 (×), (e.g. 

×
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) the numbers of the questions answered.

	Question numbers			
	1	2	3	
<b>To be completed by the candidate by marking a cross (×).</b>				
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)

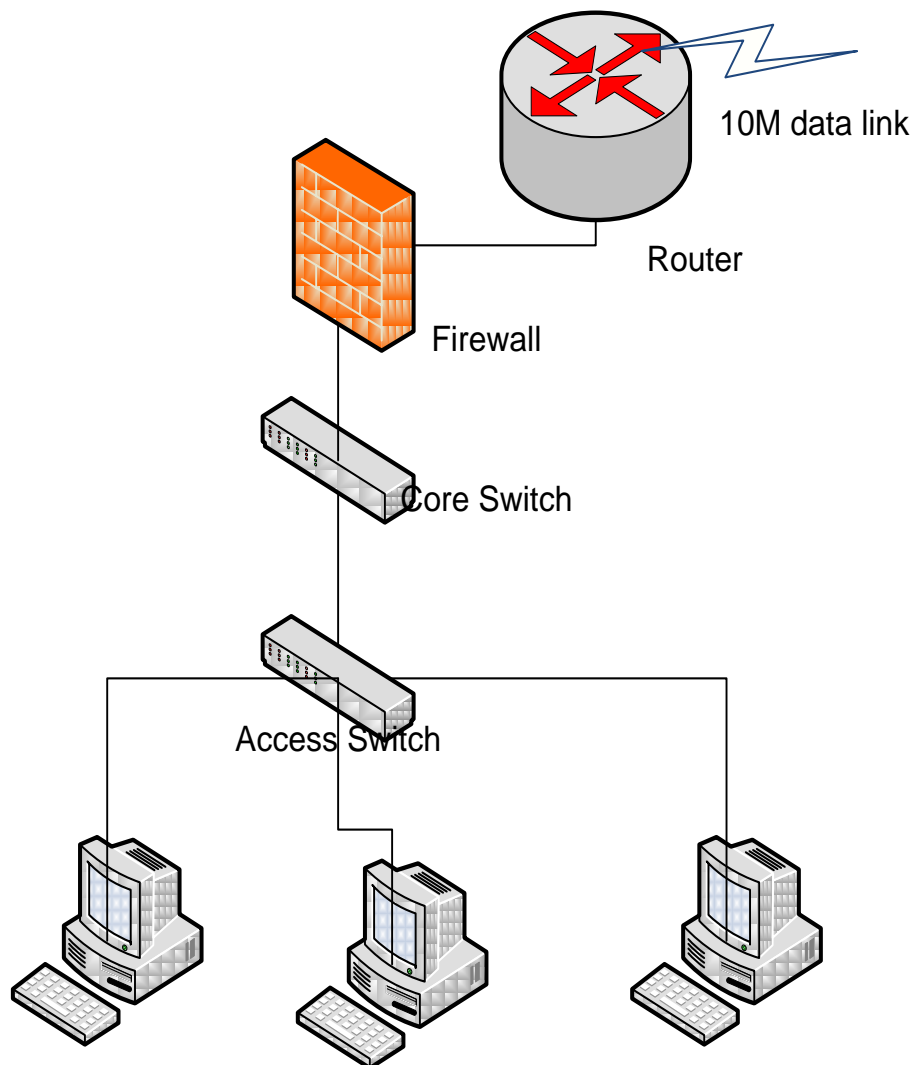
**Use QOS and provide separate priority for VC connection on all end and intermediate networking devices (switch, routers etc) are separate VLAN Must be implemented for VC connectivity.**

- 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

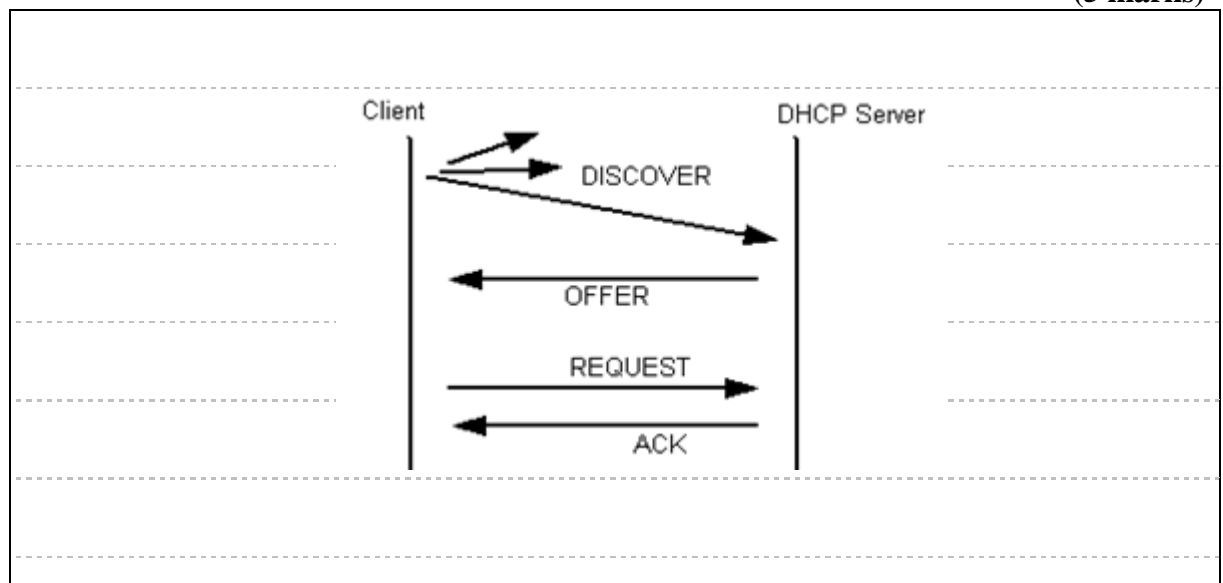
(5 marks)

**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)



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