



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2014/2015 – 2nd Year Examination – Semester 4

IT4405: Computer Networks

PART 2 - Structured Question Paper

**2nd August, 2015
(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 **12 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.
- Calculators are **not** allowed.

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
To be completed by the examiners:			

1.

- (a) Suppose a class C IP network 200.138.10.0 is to be sub-netted with a subnet mask of 255.255.255.240. For this network calculate and list the following information.

i. What is the maximum possible number of networks?

(1 marks)

ii. What is the maximum number of possible hosts on each network?

(1 marks)

iii. Write down the usable address ranges of the first three networks.

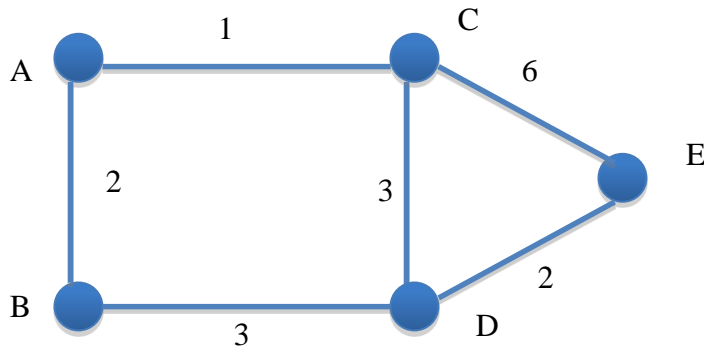
(1 marks)

- iv. Write down the broadcast addresses for the first three networks.

(1 marks)

- (b) Consider the network topology shown below where each node initially knows the link cost of its neighbours. Assuming a distance vector routing algorithm run by each node, show the distance table entries at node E after the convergence.

(3 marks)



- (c) Fill in each box of the table by term or terms most appropriate for the given application type, chosen from the lists given.

(8 marks)

Application Type	Example application protocol	Transport layer protocol	Network architecture	QoS requirements
Plain old email				
On-line game				
browser based application				
skype				
software-as-a-service				

Example application protocol: POP, SMTP, HTTP, generic (that is OS specific API based application), RTP, RTSP

Transport layer protocol: TCP, UDP

Network architecture: client-server, peer to peer, hybrid of client-server and peer-to-peer

QoS requirements: QoS required, QoS not essential

2.

- (a) An analogue TV signal is sampled at 450×500 pixels and each pixel is digitised at 32 levels of intensity. Picture frames move at a rate of 30 frames per second. The resulting raw digital signal is compressed at a 6:1 ratio to be transmitted over a channel with a 5MHz bandwidth. What should be the minimum signal to noise ratio (in dB) of the channel to support the digitised compressed TV signal? State your assumptions and the theorems used while clearly showing all steps of calculation. **(3 marks)**

- (b) Consider a shared bus Ethernet running the CSMA/CD protocol. The bus has a one way propagation delay of T . **(4 marks)**

- i. What is the minimum allowable packet length on the bus? State your assumptions.

ii. What happens if a packet has a length less than this minimum?

iii. Calculate the minimum packet length permissible on a 1Gbps, 1km Ethernet. Assume a signal propagation velocity of 2×10^8 m/s.

Express whether each of the following statements is either **true** or **false**. If, **false**, briefly explain why.

(c)

(10 marks)

i. IEEE 802.3 Ethernet and IEEE 802.11 WLAN use identical frame structures.

- ii. In IEEE 802.11, prior to the transmission of a data frame, it must first send an RTS frame and receive a corresponding CTS frame.

- iii. ARP broadcasts are typically limited to a subnet or a VLAN.

- iv. Token passing multi access schemes are preferred over contention based access schemes for carrying real time data.

- v. CSMA/CD works well with wireless LANs which are broadcast media and it is easy for any given sender to determine if its transmission is colliding with another transmission.

- vi. It is possible that a network layer router implements several types of link layers

- vii. BGP is the unique Inter-Autonomous System routing protocol available on the Internet

- viii. In IP forwarding, two successive packets will take identical paths from a common router to the same destination, based on their source IP address.

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- ix. The VLAN concept saves time and money because network reconfiguration is done through software where physical reconfiguration is not necessary.

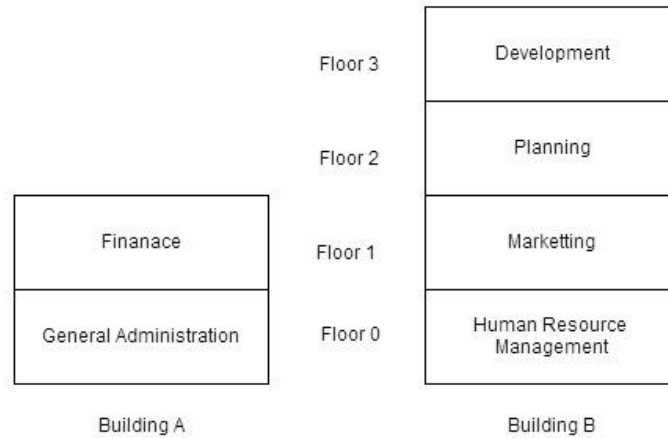
- x. Multipath radio propagation can address the issue of poor SNR.

- (d) On a wide area mobile IP network, a mobile node **M** visits foreign networks **A**, **B** and **C** in the given order, and that a source **S** establishes a connection to the mobile node when the mobile node is resident in the foreign network **A**. With the aid of a diagram list the sequence of messages exchanged between foreign agents and the home agents as the mobile node moves from network **A** to network **B** and then to network **C**.

(3 marks)

(3)

A business company occupies two buildings in a compound. One building houses the general administration and finance and the other houses the HRM, marketing, planning and development departments as shown below.



(a)

Propose a suitable backbone network design for the Intranet of the company. Identify key network devices, other supporting infrastructure such as servers. State your assumptions.

(8 marks)

[illegible]

- (b) Propose a suitable VLAN and IP address plan for the company. Assume that each division has 60 terminals and will expand into 100 in the near future. Draw diagrams to support your answer.

(5 marks)

- (c) The company's Intranet is to be connected to the Internet. Show how such a connection can be securely established.

(2 marks)
