UNIVERSITY OF DUBLIN

TRINITY COLLEGE

Faculty of Engineering, Mathematics & Science
School of Computer Science & Statistics

Integrated Computer Science   **Trinity Term 2013**
Year 3 Examination

Advanced Telecommunications (CS3031)

Wednesday 1st May 2013   Luce Upper(405)   09:30-11:30

Dr. Hitesh Tewari

Instructions to Candidates:

- Answer TWO questions
- All questions carry equal marks
- Use diagrams where appropriate

Materials permitted for this examination:

- Non-programmable calculators are permitted for this examination

Q1

a) Outline the key distinguishing features of a Local Area Network (LAN). Describe the various "pure" and "hybrid" topologies in use today giving advantages and disadvantages of each.

(15 marks)

b) Briefly explain the operation of Ethernet (802.3), Fast Ethernet (802.3u) and Gigabit Ethernet (802.3z) with particular emphasis on the slot-time, minimum frame size, network length and their interdependencies.

(20 marks)

c) Explain why there is no need for CSMA/CD in a full-duplex Ethernet LAN?

(5 marks)

d) What are the advantages of dividing a LAN with switches? Show how a switch is able to make use of MAC layer addressing to quickly switch packets from one collision domain to another.

(10 marks)

[50 marks]

Q2

a) Differentiate between Symmetric and Asymmetric key cryptosystems giving advantages and disadvantages of each approach. Show how symmetric ciphers can be used in conjunction with asymmetric ciphers for secure session key exchange and fast bulk encryption.

(15 marks)

b) Encrypt the message "THIS IS AN EXERCISE" using a shift cipher with a key of 20. Explain with an aid of an example why such ciphers can be easily broken.

(10 marks)

c) To show that you understand the security of the RSA algorithm, find d if you know that $e = 17$ and $n = 187$.

(15 marks)

d) Summarize the key differences in the services provided by the Authentication Header (AH) protocol and the Encapsulation Security Payload (ESP) protocol in IPsec.

(10 marks)

[50 marks]

(cont.)

Q3

a) Explain the meaning of the term "IP address class" and why these classes were created. List the number of networks, hosts and the default mask in each of the first three classes. Explain in detail how "classless" addressing overcomes some of the restrictions of classful addressing.

(10 marks)

b) Specify the routing table for the router R3 in the figure below.

(15 marks)
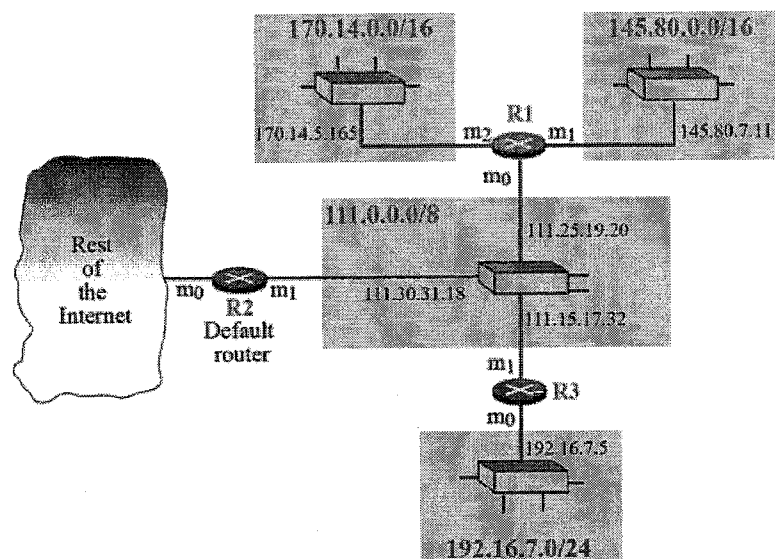
c) The routing table for a router R1 is provided in the table below. You are required to draw the topology of the resulting network. Explain any assumptions that you may have had to make.

(15 marks)

Mask	Network Address	Next-Hop Address	Interface Number
/26	140.6.12.64	180.14.2.5	m2
/24	130.4.8.0	190.17.6.2	m1
/16	110.70.0.0	------------------	m0
/16	180.14.0.0	------------------	m2
/16	190.17.0.0	------------------	m1
Default	Default	110.70.4.6	m0

d) Describe the functionality provided by the User Datagram Protocol (UDP) and the Transmission Control Protocol (TCP). Which one would you use for multimedia communications and why?

(10 marks)

[50 marks]

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