 221205/2243CN

LA TROBE UNIVERSITY, BENDIGO

Final Examination, June 1995

221205 Computing 205: Computer Network Architectures
2243CN IT8: Computer Communications And Networks

Examiner: P. Scott

Time Allowed: Three (3) Hours

Instructions to Candidates:

1. This paper consists of ***five*** (5) questions.
2. All questions should be attempted.
3. All questions have equal marks.
4. Marks for this paper total 100.
5. Sixty percent (60%) of the final assessment for this subject will be based on this paper.
6. No reference material may be used.
7 Non–programmable calculators may be used.
8. Any assumptions made in answering questions should be stated.

Question 1

(a) The following diagram illustrates a simple network architecture discussed in the first lectures in this unit. It describes a layered model of a communications system used for transferring files between computers over a network.

(i) What is meant by ***peer to peer*** communications in the context of this model?
(ii) What is the major function of the network access layer?
(iii) What tasks are performed by the transport layer?

(b) Why is a ***modem*** needed for data communications over the telephone system?

(c) What are some of the characteristics of multi-access LANs which distinguish them from point-to-point data links?

(d) Briefly describe the operation of the **CSMA/CD** protocol used in the MAC sublayer in Ethernet and 802.3 LANs

((4 + 2 + 2) + 4 + 4 + 4) = 20 Marks)

Question 2

(a) The ISDN services offered in Australia at present are Telecom's Microlink and Macrolink. What do each of these provide?

(b) You have been retained as a Data Communications Consultant by a mining exploration company which is conducting operations some 150 km west of Bendigo. The exploration generates approximately 20 Megabytes of (compressed) data per day, which must be transferred daily to the company's supercomputer in Bendigo for analysis. You have the following information[1] at your disposal:

PSTN charging

Connection: . . .	$250 per service
Annual Rental: . .	$200 per service
Tariff:	$3.50 per 10 minutes, "day rate".
Modems:	$600 each, 28.8 kbps

ISDN charging

Connection: . . .	$330 per Microlink service
Annual Rental: . .	$900 per Microlink service
Tariff:	19.2c for the first 15.0 secs and 7.2c for each subsequent 15.0 secs, day rate "data" call, 150 km
Terminal Adapters:	$1000 (notional) each

Semi-permanent charge: $9132 per annum, single B channel, 150 km.

(i) Your task is to discover which of the three options: PSTN using modems, ISDN dial-up and ISDN semi-permanent provides the cheapest point-to-point data link cost in the first year of operation. Assume the data is transferred seven days per week and ignore any "real world" extras, such as protocol and synchronisation overheads, when calculating transmission times.

(ii) Explain briefly how your decision in part (i) would change if, instead of simply transferring the data once per day in a "batch" mode of operation, the data link was required for a different purpose (such as Internet access) for which 24 hour availabilty is needed.

(6 + (8 + 6) = 20 Marks)

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[1] Note that these prices are notional, for the purposes of this question only, and do not necessarily bear any resemblance to prices actually charged by Telecom or any other telecommunications provider.

Question 3

(a) What are the three main characteristics of ***IP*** (Internet Protocol) datagram delivery?

(b) An IP datagram has a header field field called Time To Live (TTL) which is decremented each time the datagram crosses a router. Why is this done and what happens if it ever reaches zero?

(c) The dotted sequence **`138.80.128.18`** is an Internet Protocol (IP) address for a certain computer which implements the ***TCP/IP*** protocol suite. For this computer, give the ***class*** of the IP network to which it is connected and state the network and host parts of the address.

(d) The ***TCP*** protocol is the most common higher layer protocol used "on top of" IP in the Internet protocol suite.

  (i) What functionality does TCP provide to the network user?

  (ii) In the context of TCP, what is meant by the terms ***server*** and ***client***?

  (iii) What is meant by the term ***port*** in the context of the TCP protocol?

(e) What is a host's Internet ***Domain Name*** and how is it related to the host's IP address?

(3 + 3 + 3 + (2 + 4 + 2) + 3 = 20 Marks)

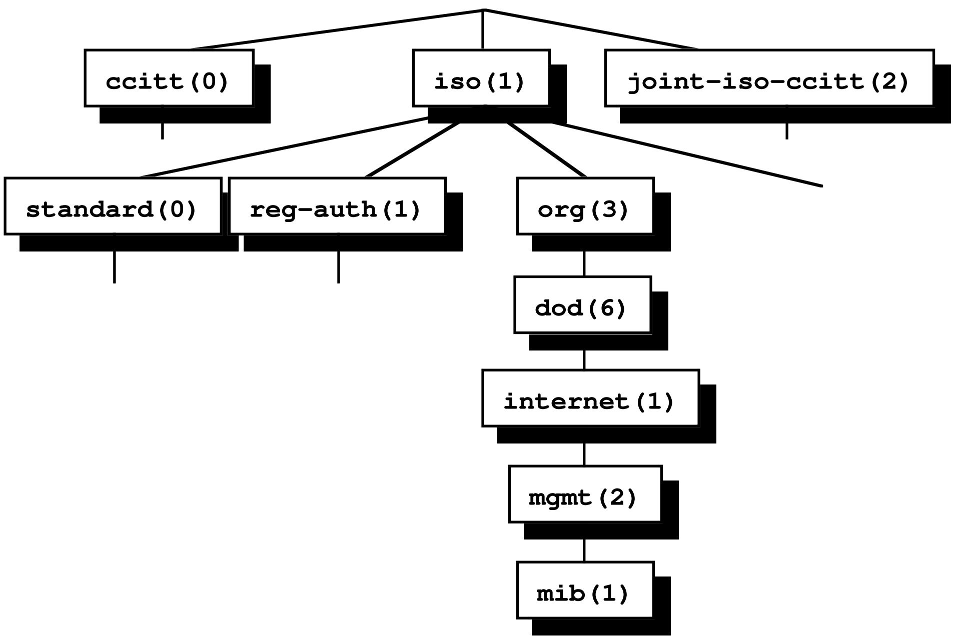
Question 4

(a) The ***ASN.1*** specification language is an integral part of the OSI Reference Model upper layer architecture.

(i) What is meant by the term ***abstract syntax***, as implemented in ASN.1?

(ii) What is the general format of an ASN.1 data structure which has been encoded for transmission using the ASN.1 ***Basic Encoding Rules*** (BER)?

(b) The following diagram is used to describe the Structure of Management Information (SMI), in the SNMP protocol. What is the **`OBJECT IDENTIFIER`** of the SNMP MIB?



(c) Within the MIB, one interesting variable (defined using ASN.1) is

`ipForwarding OBJECT-TYPE ::= { ip 1 }`

How would you refer to this variable if you were interested to obtain its *actual value* using an SNMP ***get*** request?

(d) What is the function of the ***get-next*** request in SNMP, and why is it regarded as particularly powerful?

((4 + 4) + 4 + 4 + 4 = 20 Marks)

Question 5

(a) What is ***Electronic Data Interchange*** (EDI)? How is it different to an electronic mail service?

(b) What is ***client/server computing***? In your answer, you should distinguish client/server computing from any other form of distributed data processing.

(c) What is meant by the term ***packet filtering firewall***? Where would such a device be used and for what purpose?

(d) What is a ***Vernam Cipher***? Why would you not use Vernam Cipher for large messages.?

(e) Give one advantage that a simple, single key encryption system has over a public key encryption system. Give one advantage of a public key system.

(4 + 4 + 4 + 4 + 4 = 20 Marks)