

Department of Computer Science
University College London

Cover Sheet for Examination Paper to be sat in March 2001

COMPZ04: Network Architecture

Answer TWO questions from Section A and TWO questions from Section B

Calculators are permitted

Checked by First Examiner:

Date:

Approved by External Examiner:

Date:

SECTION A

Answer TWO questions from this section

1. a) Explain the operation of mesh-type networks which use the *virtual circuit* style of operation. Explain the strengths and weaknesses of virtual circuits, especially with respect to quality of service management.

[10 marks]

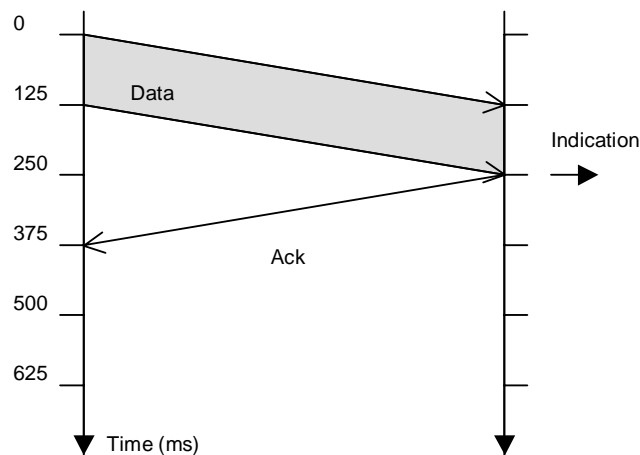
- b) *Asynchronous Transfer Mode* (ATM) offers a service class called *Constant Bit Rate* (CBR). Explain the purpose of this service and its principle characteristics. Briefly outline the issues that arise in implementing such a service.

[4 marks]

- c) Modern Ethernet configurations make increasing use of *Ethernet switches*. Describe the operation of an Ethernet switch and illustrate, by means of examples, the advantages that are brought about by their use.

[11 marks]

2. a) The diagram shows the transmission and acknowledgement of a single Internet *Transmission Control Protocol* (TCP) segment across a 64Kbps link. **Note that all protocol header, CRC and framing overheads have been ignored.**



Assuming that the round trip delay remains roughly constant, that the transmitter operates a timeout of 500ms from the transmission of the first bit of a segment, that the segment size remains constant and that the receiver keeps the window size fixed at 4K bytes.

[Question 2 continued on next page]

[Question 2 continued]

- i) Draw a clear time-sequence diagram, based on the one above, which illustrates how the protocol recovers from the loss of a single TCP segment.

[6 marks]

- ii) Estimate the throughput of this protocol in bytes per second:

- On an error free channel;
- On a channel where one packet in every twenty is destroyed by an error.

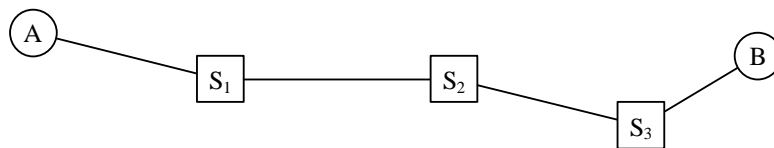
[8 marks]

Explain your reasoning in each case.

- iii) Discuss whether the window size used is optimal.

[3 marks]

- b) The diagram shows a virtual circuit between two hosts A and B and passing through three switching nodes.



A continuous request, ARQ protocol is operating on the virtual circuit through three switches. This protocol includes "stop" and "go" messages for flow control. Two modes of operation may be selected. In the first mode, stop and go messages are processed only at A and B and are passed transparently by the switches. In the second mode, stop and go messages invoke processing at the switches. Thus, in mode two, on receipt of a stop message from B, S₃ ceases forwarding frames to B with immediate effect. Only if S₃'s internal buffer occupancy crosses some threshold does S₃ issue a stop message to S₂.

Comment on the characteristics of the two modes especially from the points of view of:

1. the amount of data that is buffered in the network;
2. the threshold the receiver should use to trigger the issue of stop and go messages.

[8 marks]

3. a) A *Management Information Base* (MIB) is to be constructed for use with the Internet *Simple Network Management Protocol* (SNMP). The MIB relates to a transport protocol and includes a statistics table which holds, for each current connection; counts of segments received and transmitted, source and destination ports, source and destination IP addresses. The table is indexed by an integer "connection id".

i) Describe the way this table would be specified with emphasis on syntax definition and *object* naming. (**There is no need to give a precise, formal specification of the table**).

[8 marks]

ii) Describe the way in which *values* in the table would be named.

[2 marks]

iii) Give a detailed account of the SNMP operations that would be performed by a manager wishing to discover the counters for all connections to a particular host.

[7 marks]

b) What is the role of a *concrete transfer syntax*? The concrete transfer syntax used within CORBA (*Common Object Request Broker Architecture*) includes no typing information whilst that used within Java RMI (*Remote Method Invocation*) is fully typed. Explain this statement and discuss reasons for these contrasting approaches.

[8 marks]

