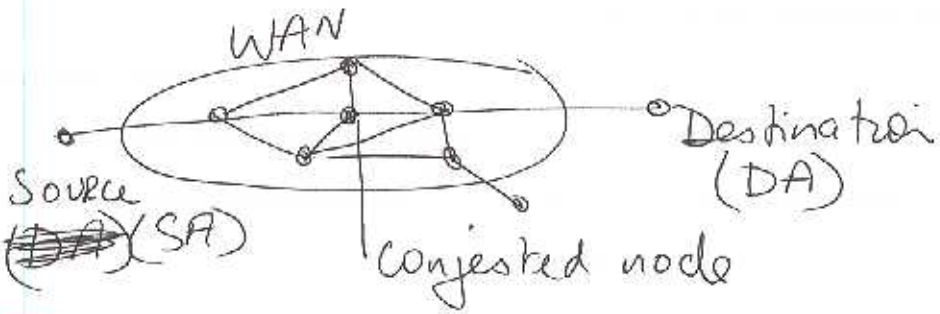
Summer 2001, Telecommunications EE4004

Question 2

10 (a) Frame Relay and ATM for fast packet switching mentioning FRAME formats, congestion control and acknowledgement handling.

Congestion Control: These fast networks typically use 3 types of congestion control



[1] Implicit Congestion Control: DA realises packets are missing and signals SA to slow down

[1] Forward Explicit Congestion Control: Congested node signals DA which in turn signals SA

[1] Backward Explicit Congestion Control: Congested node directly signals SA.

Ackn

Acknowledgment handling

With Frame Relay and ATM these are:

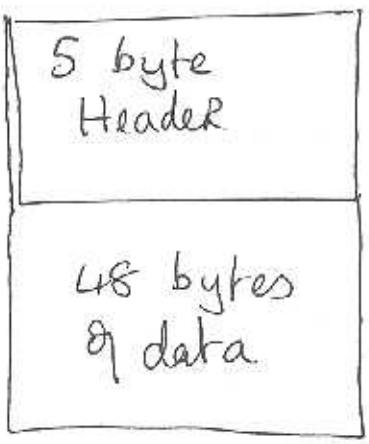
1. Frame Relay: Error detection but not correction. Frames with errors are just dropped.
2. ATM: Can perform some error correction on header only
3. Frame Relay/ATM: There are no link by link acknowledgements

Frame formats

Frame Relay

Variable Size

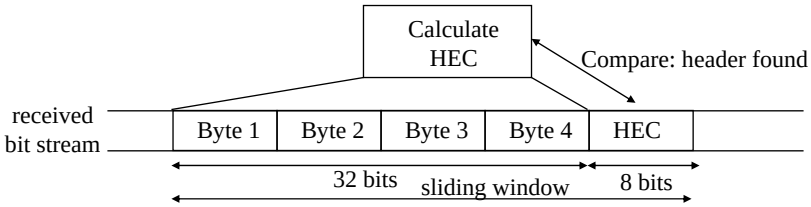
ATM



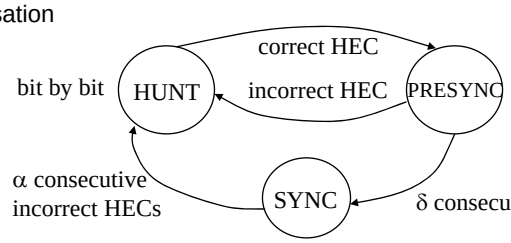
Fixed Size

EE4004 Summer 2001 Q2(b) 6 marks

The HEC is used to determine where an ATM cell starts. The receiver uses a 40 bit sliding window and assumes that the first 32 bits are the first 4 bytes of the ATM header and the next 8 bits are the header error control (HEC). For no errors, the HEC should give a known pattern. If this is achieved then the receiver has found the cell boundaries, if not it moves the sliding window and tries again. Once the cell boundaries have been found, succeeding cell boundaries are determined by counting bits.



Synchronisation



α and δ are numbers chosen to give the best performance – usually less than 10.

EE4004 Summer 2001 Q2(c) 4 marks

(i) The telephony industry would prefer 32 byte cells so to reduce the delay between cells

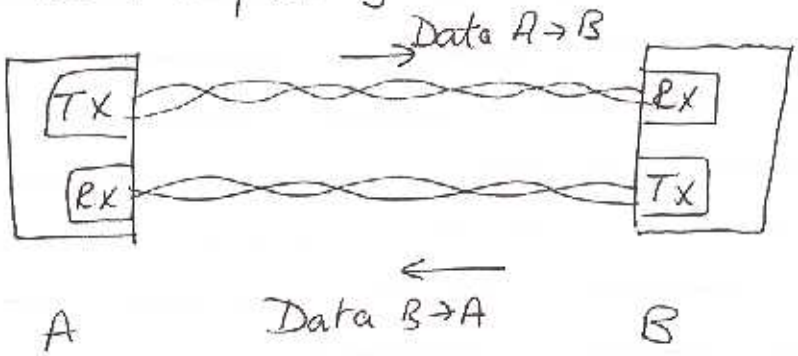
(ii) The data communications industry would prefer 64 byte cells to improve the efficiency.

Question 3

8 (a) Signal Duplexing methods available

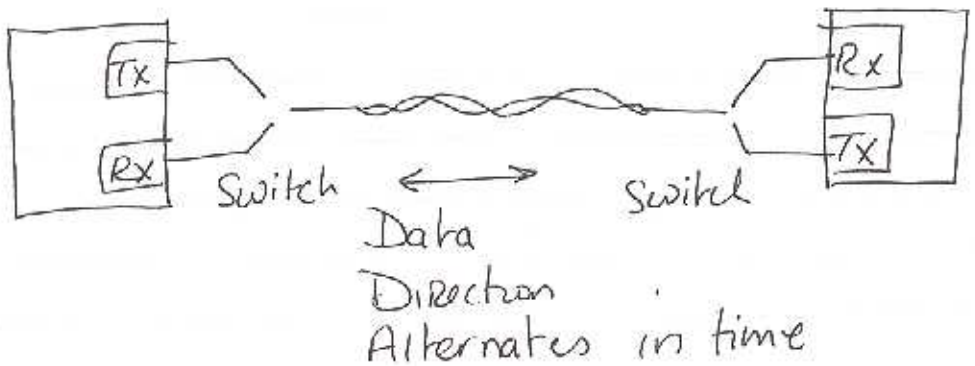
i) four wire duplexing

[2]



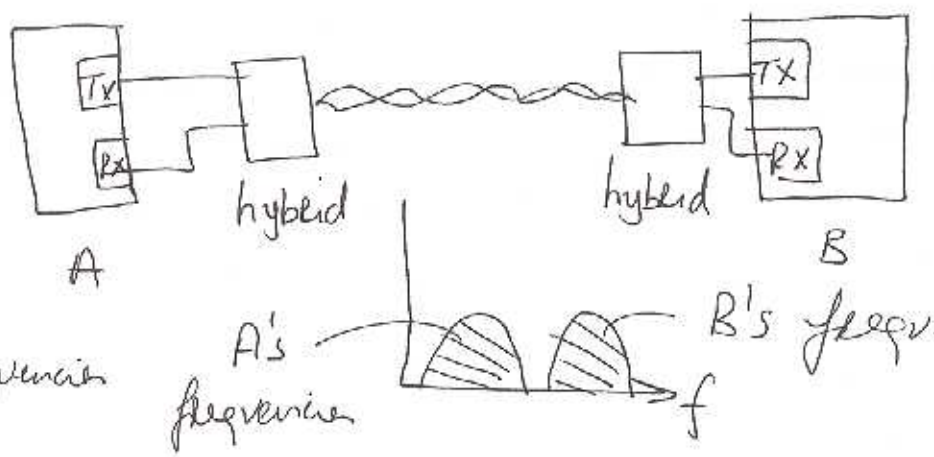
ii) Time Division Duplexing

[2]



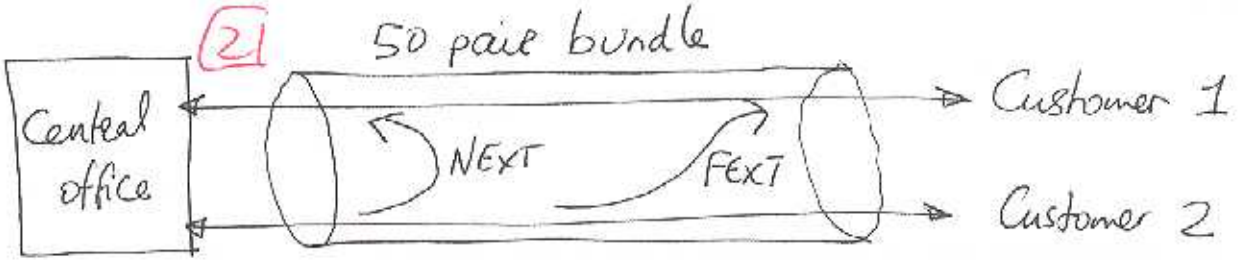
iii) Frequency Division Multiplexing

[2]



[2] iv) Echo cancellation: Use same lines and same frequencies But need analog hybrid circuit and sophisticated DSP filter circuits

6 Qs (b) The main sources of interference arise from cross talk



(2)
Near End Crosstalk: NEXT: The central office transmitting to customer 2 may interfere with weak signals being received from customer 1

(2)
Far End Cross Talk: FEXT: The central office transmitting to customer 2 may interfere with data it is also sending to customer 1.

Usually NEXT is more of a problem than FEXT.

6Q3 (c)

(2) i) DMT is Discrete Multitone Transmission. Here the frequency range in broken up into several smaller channels which are modulated individually and carry a low data rate per channel but all add up to a high data rate.

(2) ii) CAP: Carrierless Amplitude Phase. Here the full frequency range is used for one channel which carries a high data rate.

In terms of the usage of frequency and time the differences are