Autumn 2001 : Telecommunications EE4004
Question 2

8

(a) Application : The network service programs
eg mail, ftp

Presentation — Translation between different formats
DOS/UNIX ASCII/EBCDIC

Session — Set up, maintaining and closing down
a link. Ensuring consistency & information

Transport — Make data flow transparent to network
eg re orders packets

Network — Looks after the routing & data through
network

Data Link — Protocols for point to point data transfer
and error detection eg HDLC

~~Physical~~
Physical — The electrical and mechanical
properties of the interface

Q2 (b) Types & Switching

4

1. Circuit Switching (e.g. PSTN)
2. Message Switching
3. Packet Switching : Virtual circuit
   : Datagram

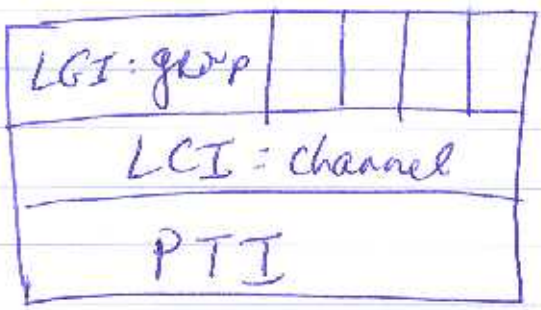
(c) X.25 packet

4

3 or 4 bytes long

Up to 4096 bytes

Header make up



LCI : Logical channel identifier
PTI : Packet Type Identifier

Question 3

6 (a) Sources of noise and cross-talk which degrade the signals

i) Local radio transmissions, lightening

ii) Signal Reflections at bridged taps

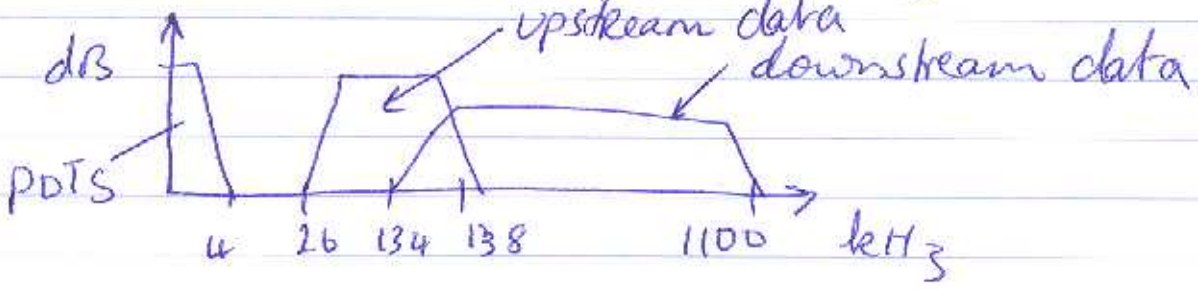
iii) Interference from other users

NEXT: Near End Cross Talk

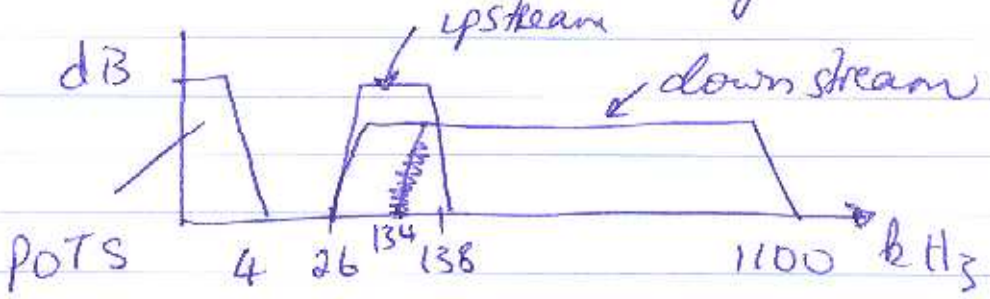
FEXT: Far End Cross Talk

b) Allocation of frequency spectrum in ADSL

5 i) Frequency Division Multiplexing



ii) Echo Cancellation System



5 c) The main modulation methods for transporting the data are
i) Discrete Multitone Technology (DMT)
ii) Carrierless Amplitude Phase (CAP)

These both use Quadrature Amplitude Modulation (QAM) but differ in how they use the frequency spectrum.
DMT breaks up the spectrum into a set of subbands each with a signalling rate of 4kHz and a symbol duration of 250μs.
CAP considers the channel to be made up of just one sub-band with a much higher signalling rate and a shorter symbol duration of ~1μs.