

Signalling system seven (SS7)

		TCAP	ISUP
Upper Layer	TCAP	SCCP	ISUP
Network		MTP level 3	
Data Link		MTP level 2	
Physical		MTP level 1	

MTP: Message transfer part

SCCP: Signalling connection control part

TCAP: Transaction capabilities application part

ISUP: ISDN user part

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MTP level 1: uses several physical layer specifications

MTP level 2: packetizing, address in headers, error checking

MTP level 3: end-to-end connectivity (routing)

Transport layer: SCCP - extended routing, flow control

Upper layers: voice calls, ISDN services

Telephone network services

• Analog services

- Analog switched services
- Analog leased services

• Digital services

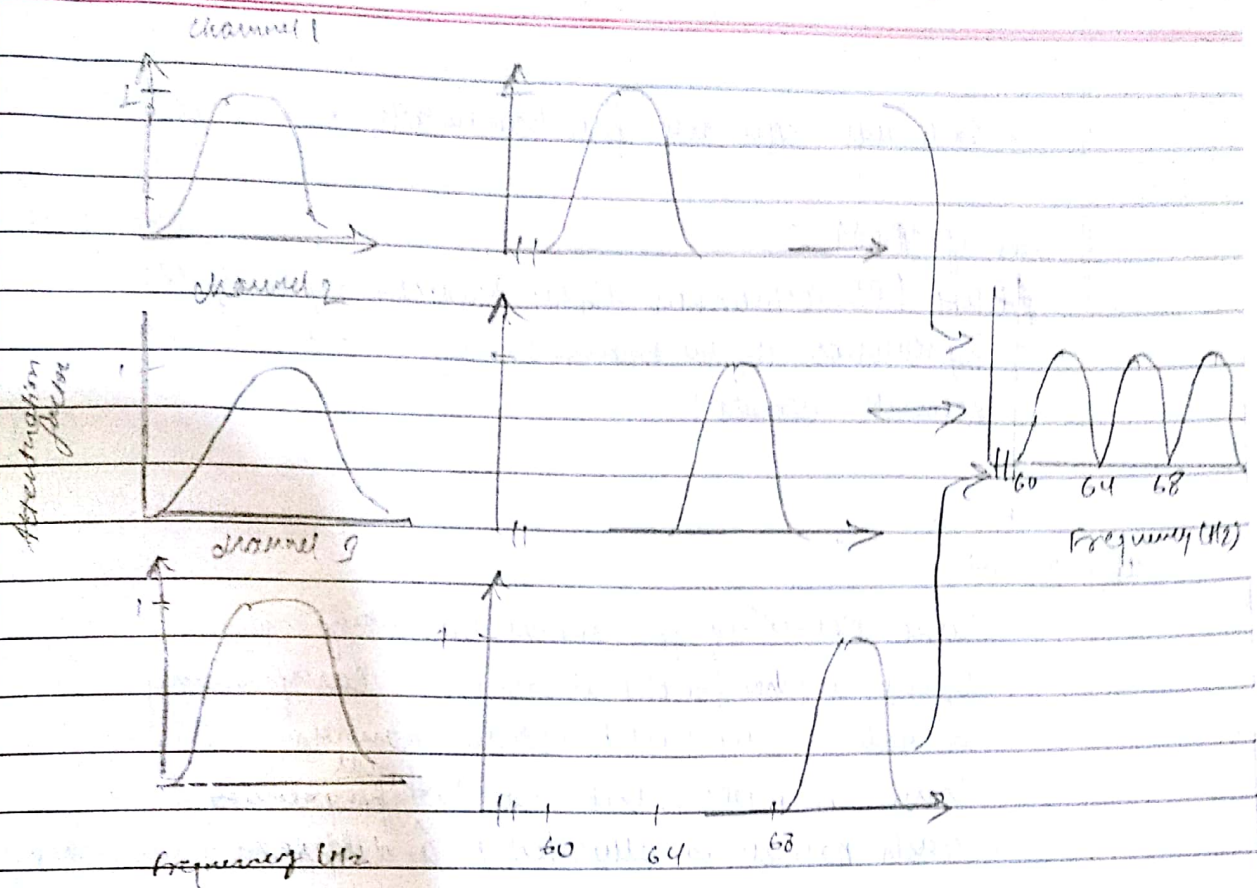
- Switched 56 services
- Digital data services

Multiplexing

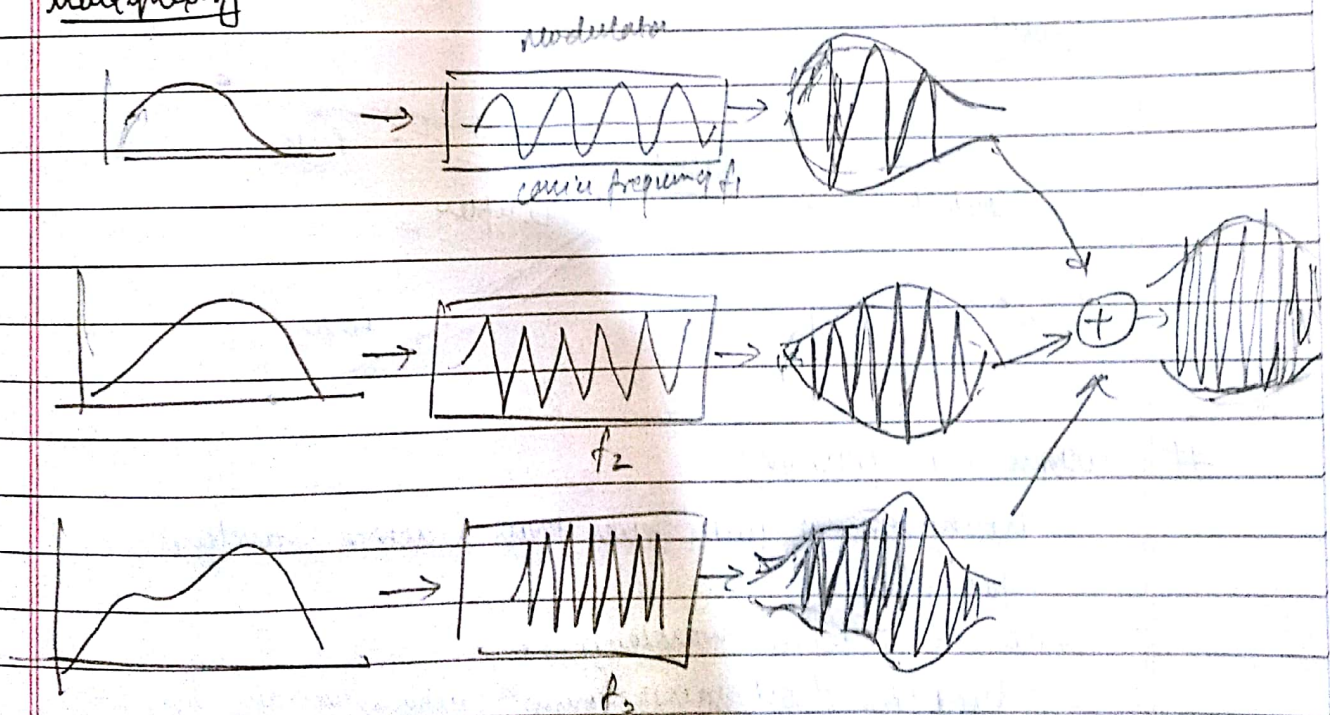
- Frequency division multiplexing (FDM)
- Time division multiplexing (TDM)
- Wavelength division multiplexing (WDM)

FDM

Dividing total bandwidth into a series of non-overlapping frequency bands, each of which can carry a separate signal.



Multiplexing



TDM

- Combines several low-rate digital channels into one high rate one.
- Each user of the channel is allocated a small unit of time interval during which they may transmit a message.
- Data from each user is multiplexed into a frame

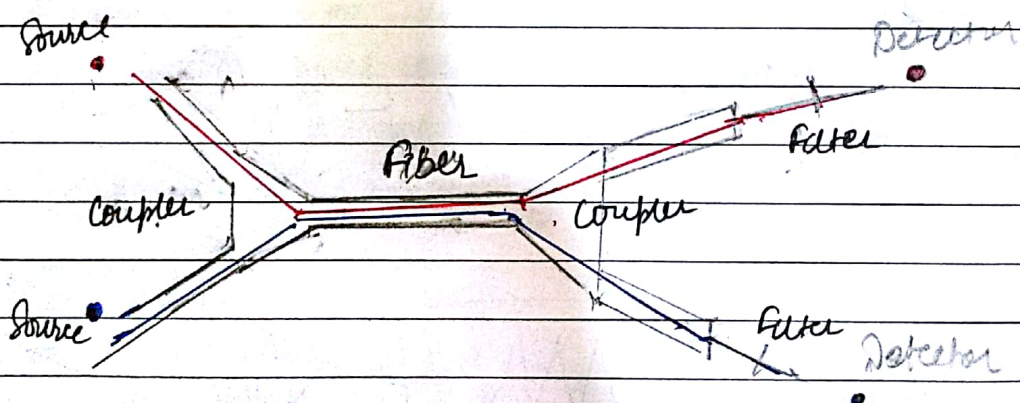
- Each user can use full bandwidth.

Uses of TDM

- PDH (Plesiochronous digital hierarchy) system/PCM.
- Synchronous digital hierarchy (SDH) synchronous optical network (SONET)

WDM

- Basic technology for optical networking.
- Using a fibre (or optical device) to carry many separate & independent optical channels.
- Same as FDM, but used for ^{optical} frequencies.
- Each channel is allocated to a different frequency & multiplexed into a single fibre.



Coarse WDM (CWDM)

- WDM systems with fewer than 8 active wavelengths per fiber.
- CWDM is defined wavelengths.
- Used for short-range commⁿ; used wide-range freq with a spread spec.
- Cheap & cost effective.

Dense WDM (DWDM)

- More than 8 active
- Used for long-haul transmission with wavelengths packed tightly together.
- Used 40+ channels in the same frequency range as 2 CWDM channels.

TDM: Merits

- Full duplex is possible.
- Easier to reconfigure
- Optical components are smaller & more reliable
- Higher bandwidth
- High security

TDM: Demerits

- Cross phase modulation & four wave mixing (FWM) are
- the major limitation.
- More cost
- Difficulty in wavelength tuning, difficult in cascaded topology

H.W

Q. Discuss FDMA, TDMA & WDMA schemes accompanied by explained diagrams.