Ajay Kumar Garg Engineering College, Ghaziabad

Department of ECE

Model Solution Sessional Test-2

Course:	B.Tech	Semester:	VII
Session:	2017-18	Section:	EI-1
Subject:	Telemetry Principles	Sub. Code:	NIC-702
Max Marks: 50		Time:	2 hour

Section-A JAI SHREE GUPTA

Ques(1):- Write the difference between bit rate & baud rate ?

Ans:- Bit rate :- The number of bits per second that can be transmitted along a digital n/w.

Baud rate :- The baud rate is the rate at which information is transferred in a communication channel.

Ques(2):- Draw the block diagram of PLL.

Ans:- Basic block diagram of PLL :-

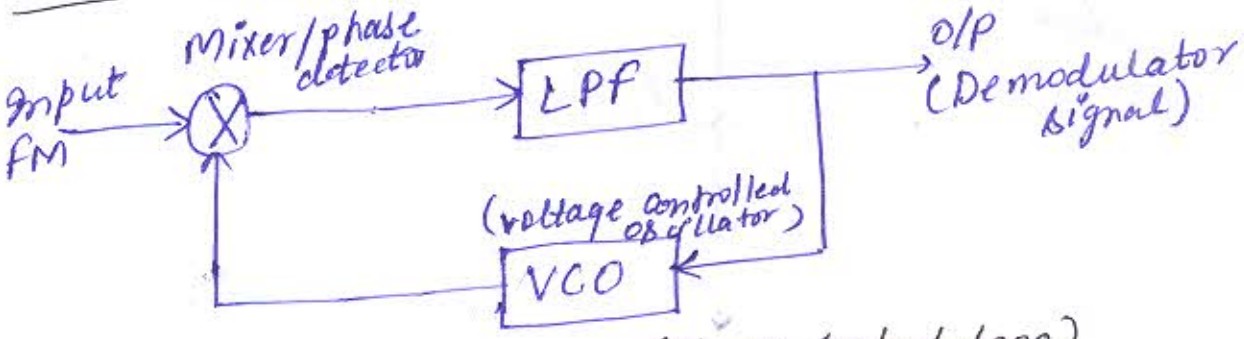


fig :- PLL (Phase Locked Loop)

PLL is an electronic ckt with a voltage or VCO that constantly adjusts to the match the freq of an i/p signal

Ques③:- what are the advantages of superheterodyne receiver has over the TRF receiver?

Ans:- Advantages of superheterodyne receiver over the TRF receiver:-

→ Superheterodyne receiver contains a combination of amplification with freq mixing, and is by far the most popular architecture for a new receiver.

→ heterodyne means ⇒ to mix two signals of different freq together.

→ Superheterodyne uses an intelligent technique with down convert any carrier freq of the radio stations into a single carrier freq (IF).

Ques④:- what is constellation diagram? In what connection is it referred to?

Ans:- Constellation diagram:-

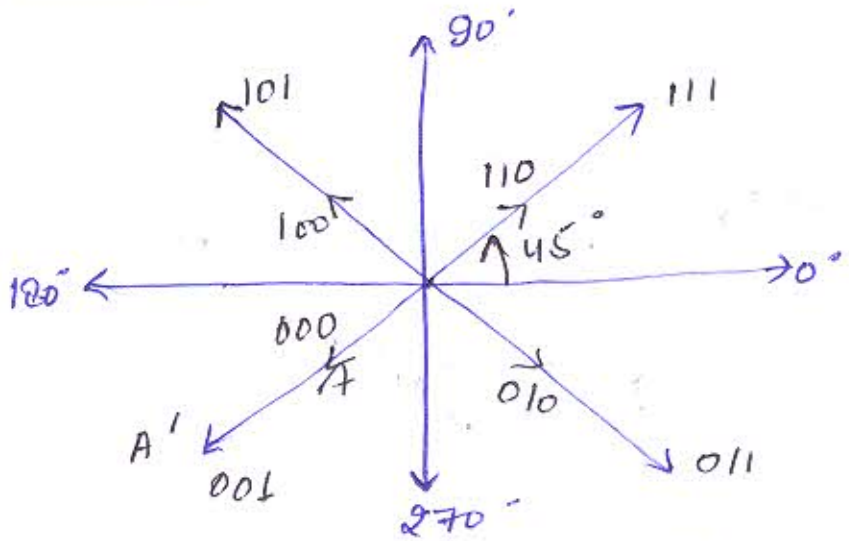


Fig - Constellation diagram

It is referred in QAM (Quadrature Amplitude modulation)..

Ques (5):- What is Bisync modem protocol?

Ans:-

SYN	SYN	SOH	HEADER	STX	DATA BLOCK	ETB/ ETX	EOT	BCC	BCC

Fig:- The bisync (modem) protocol

→ start with two SYN chars → for signalling the beginning of transmission
→ SOH → identify the msg sent / the block number / specific routing destination / priority code.
→ STX (start of text) → next character sent.
→ followed by transmission of data block → no start/ no stop code is necessary. block is within 256 char.
→ ETB (End of block) / ETX (End of text) → if msg is completed are transmitted.
→ EOT (End of transmission)
→ BCC (binary check code) → for error detection.

Section - B

Ques (6):- Discuss the telemetry standard of of baseband configuration in terms of freq as stipulated by IRIG.

Ans:- IRIG Standards:-

modulated o/p $e_m(t) = V_{c,max} \cos\left(\omega_c t + \int k V_{m,max} \cos \omega_m t\, dt\right)$

where $V_m(t) = V_{m,max} \cos \omega_m t$

$e_m(t) = V_{c,max} \cos\left(\omega_c t + K_f' V_{m,max} / (f_m \sin \omega_m t)\right)$

where $K_f' = (1/2\pi) K_f$

$K_f' V_{m,max} / f_m = \Delta f_c / f_m = m_p$

$f_{FM}(t) = V_{c,max} \cos(\omega_c t + m_p \sin \omega_m t)$

→ For transmitting a sinewave signal by FM the BW is extended by twice the peak deviation $K_f' V_{m,max}$ over the modulation freq f_c.

→ For avoiding cross talk, a finite guardband b/w adjacen channel must be there.

→ These consideration have led to some acceptable baseband which are considered optimum for standard multiplex configuration.

→ Inter Rang Instrumentation Group (IRIG) developed in 1975 two telemetry standards of baseband configuration ← the proportion bandwidth (PBW) configuration
the constant bandwidth (CBW) configuration.

→ The choice of centre freq of the adjacent channel has been made so that the difference is approximately 4 times the peak deviation of these channels.

→ This is to provide a suitable guard-band for adequate separation b/w the channels to avoid cross talk b/w them.

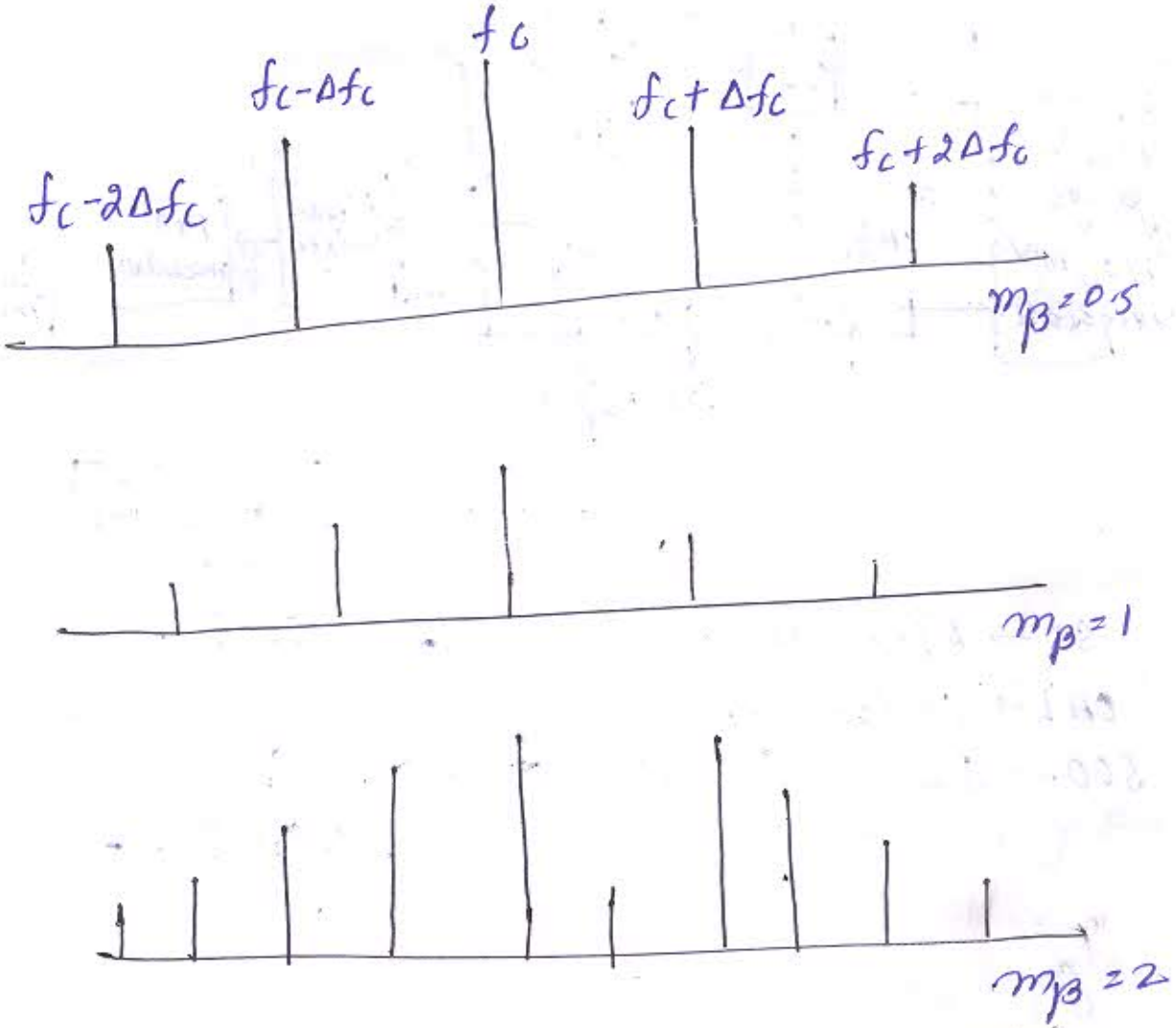
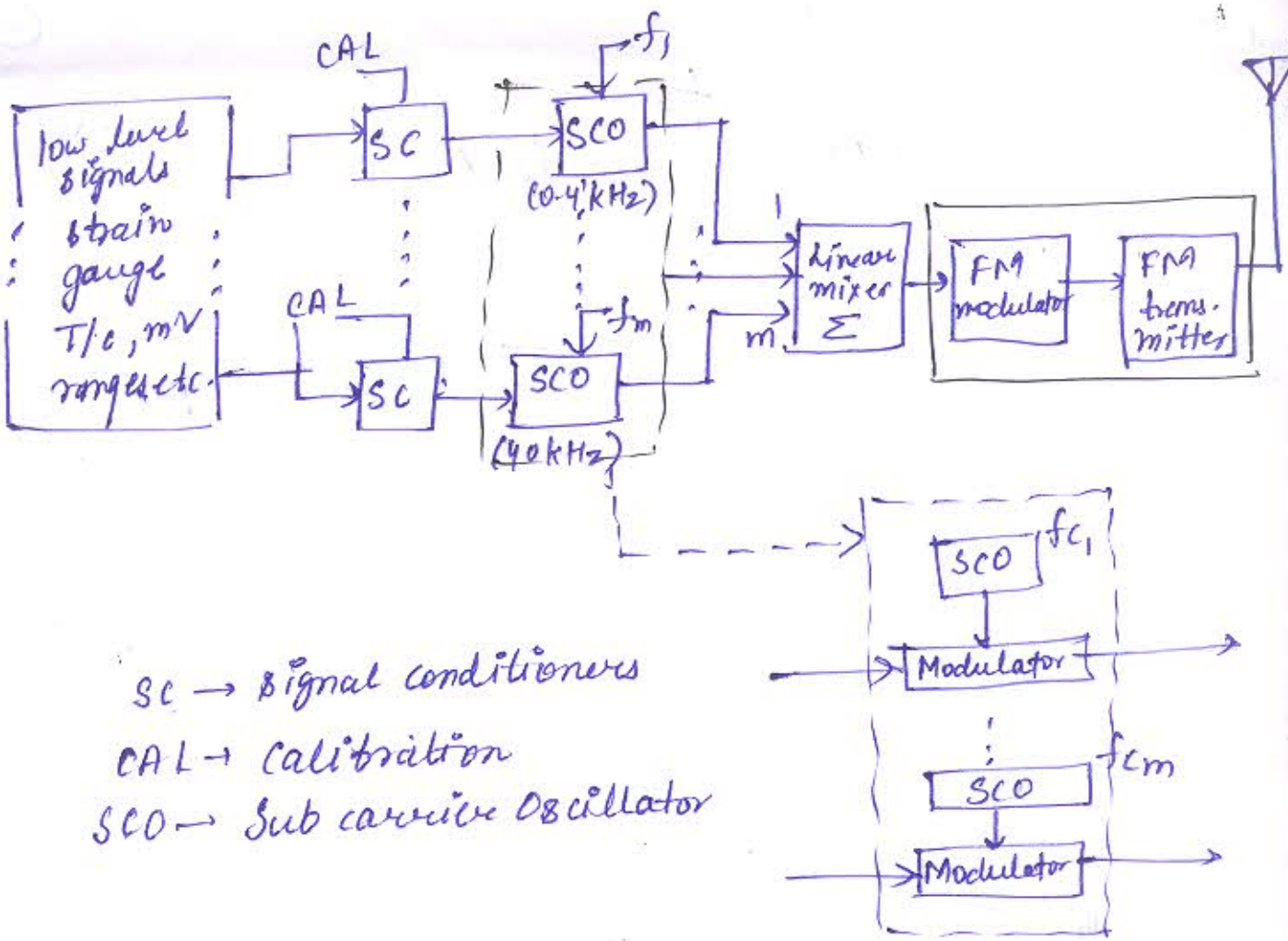


fig:- FM spectra at different modulation index.

Ques (4):- Draw the block diagram of a complete telemetry scheme using freq division multiplexing and demultiplexing. What are the advantages of FM and what are its demerits.

Ans:- Block diagram of a complete telemetry scheme using freq division multiplexing and demultiplexing →



SC → Signal conditioners
CAL → Calibration
SCO → Sub carrier Oscillator

fig:- Scheme of the transmitting side of FDM system

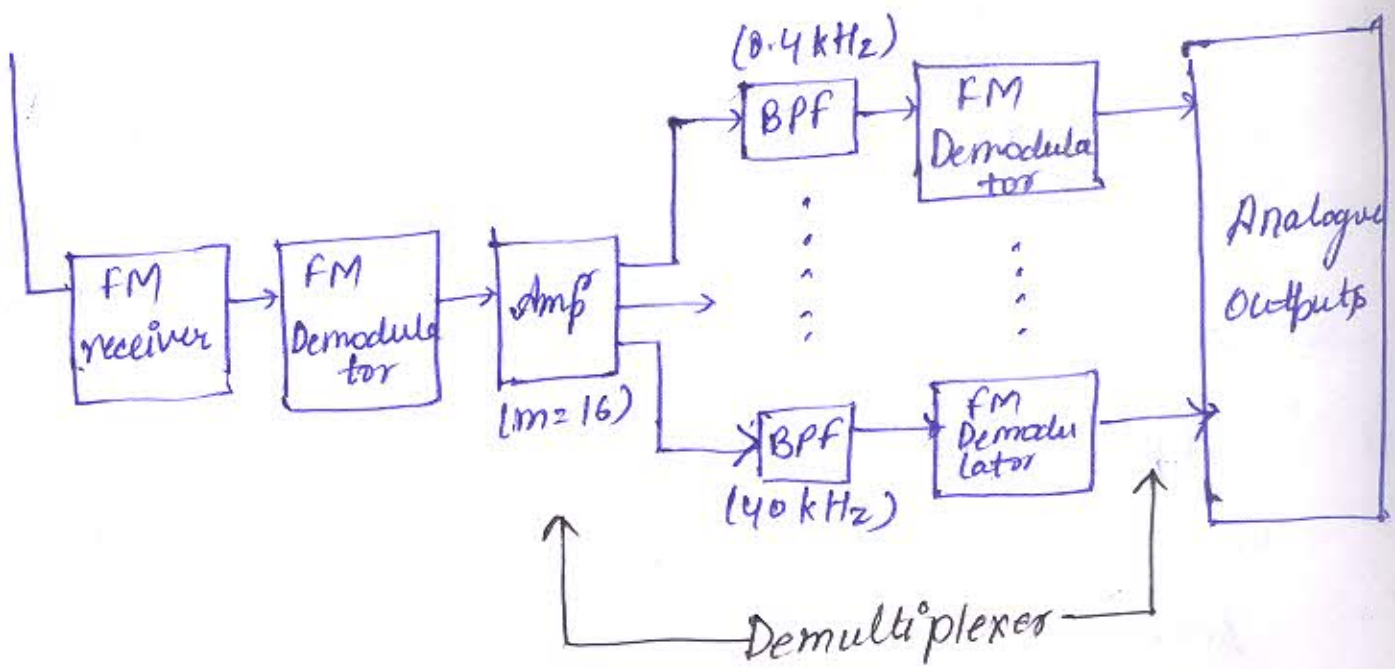


fig:- scheme of the receiving side of FDM s/s

→ FDM type comprises a number of data channels each of which modulates a separate sub-carrier oscillator.

Advantages of FDM:-

→ A large number of signals (channels) can be transmitted simultaneously.
→ FDM does not need synchronization.
→ Demodulation of FDM is easy
→ Due to slow narrow band fading only a single channel gets affected.

Demerits of FDM:

→ Communication channel must have a very large Bw.
→ Inter modulation distortion takes place.
→ Large number of modulators and filters are required.
→ FDM suffers from the problem of crosstalk.
→ FDM channel get affected due to wide band fading.

Ques ⑧:- How companding is done using suitable amplifiers both on the transmitting and receiving side?

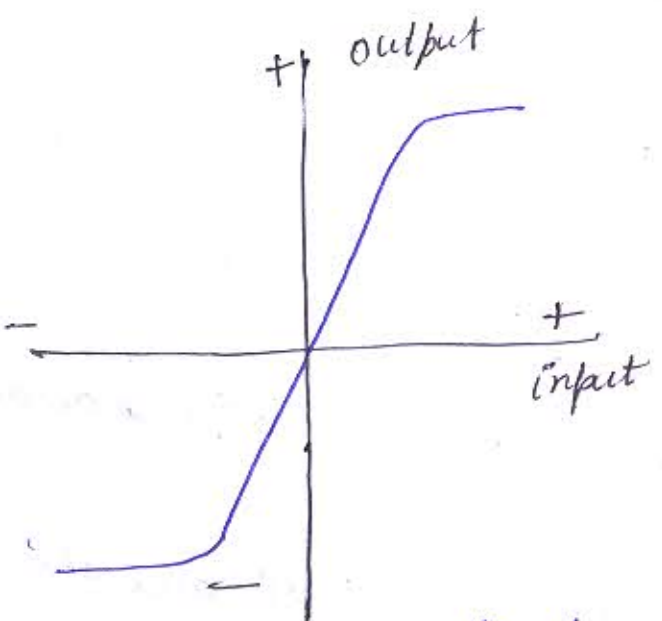
Ans:- Quantization error in low level signals becomes large.
→ Such signals are very susceptible to noise and this introduces spurious spikes and pulses.
→ Both the error produce distortion.

→ The problem is tackled by emphasizing the low-level signal and de-emphasizing the higher level ones, i.e. a process of signal expansion and compression is followed.

→ This process is known as companding and is performed at the transmitting end and often in the ADC itself where quantizing steps are made unequal.

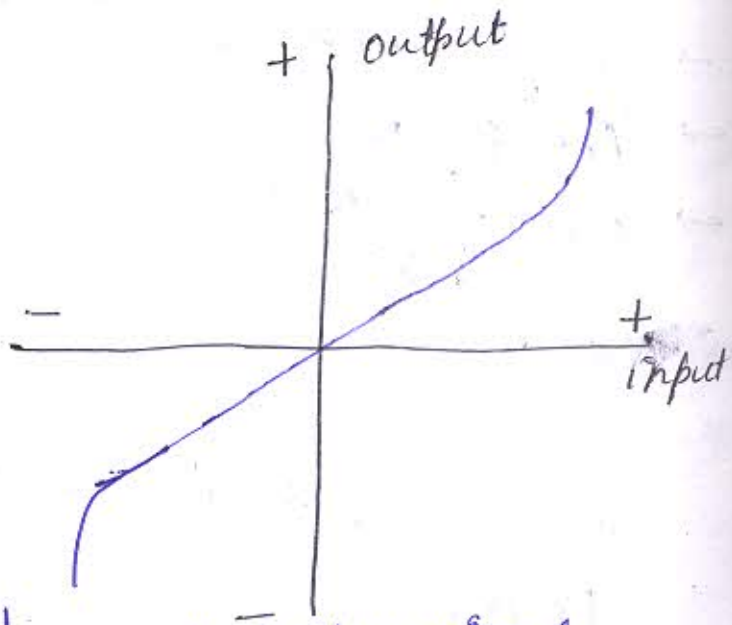
→ This allows the signal to be retrieved in the original condition.

→ Non-linear Amplifier are designed for companding purpose.



→ at lower signal Amp^r Gain increase

fig (a) - Companding amplifier curve



at higher signal amp^r gain decreases

fig (b) → The curve at the receiving side.

Ques ⑨:- Describe a Quadrature Amplitude modulation.

Ans:- Quadrature Amplitude Modulation:-

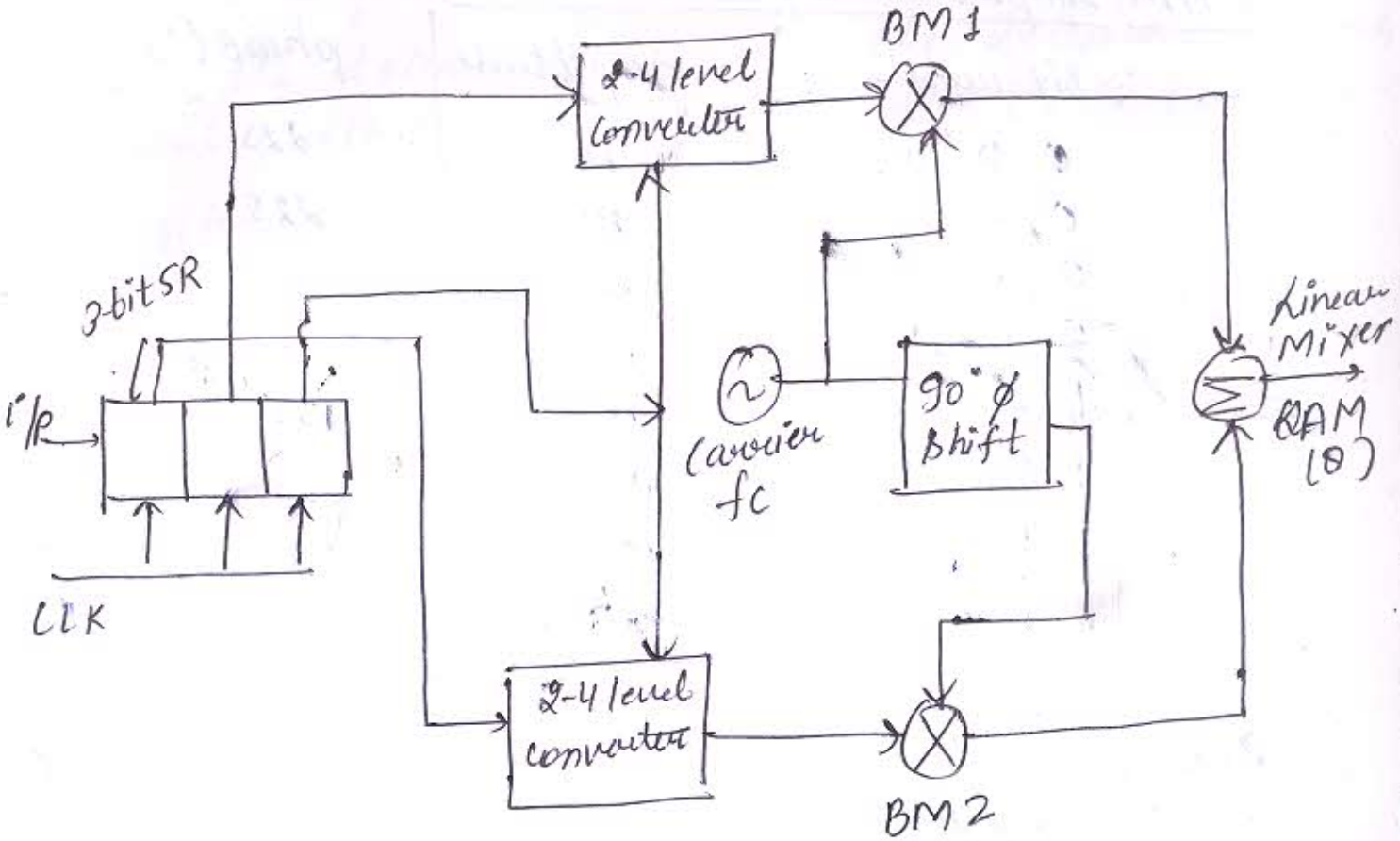


Fig:- QAM modulation scheme.

→ QAM combines both phase and amplitude modulation.
→ If the phase is modulated to have n distinct values and the amplitude is modulated to have m distinct values, then the O/P is nm-QAM O/P.
→ A popular 8 QAM O/P has a QPSK O/P associated with two different carrier Amplitude.
→ In addition to the carrier being phase shifted by 90° to be fed to the balanced modulator 2 for obtaining four-phase conditions, two bit combination

words are also first converted into four-level dc voltages which come to the modulators as i/ps.

QAM Amplitude & phase shifts:-

3-bit words	Amplitude	phase (°)
0 0 0	A	225
0 0 1	A'	225
0 1 0	A	315
0 1 1	A'	315
1 0 0	A	135
1 0 1	A'	135
1 1 0	A	45
1 1 1	A'	45

Ques (10):- Why Modems are needed for telephone communication? Discuss some popular DTE-DCE standard.

Ans:- A binary coded signal when desired to be transmitted through a link, say, a telephone n/w, it would not pass as the circuitry involved basically is for ac application and dc signal, i.e. pulses would not get through these.
→ Also, high speed binary data would, most likely, be filtered out of the S/s that has a finite small Bw.

→ For this reason binary data are converted into so-called analogue signals by modulation which, when received, are demodulated & reconstructed into binary data.

→ When the telemetry s/s uses the telephone channel, a device called MODEM (Modulator - Demodulator) is often used for this purpose.

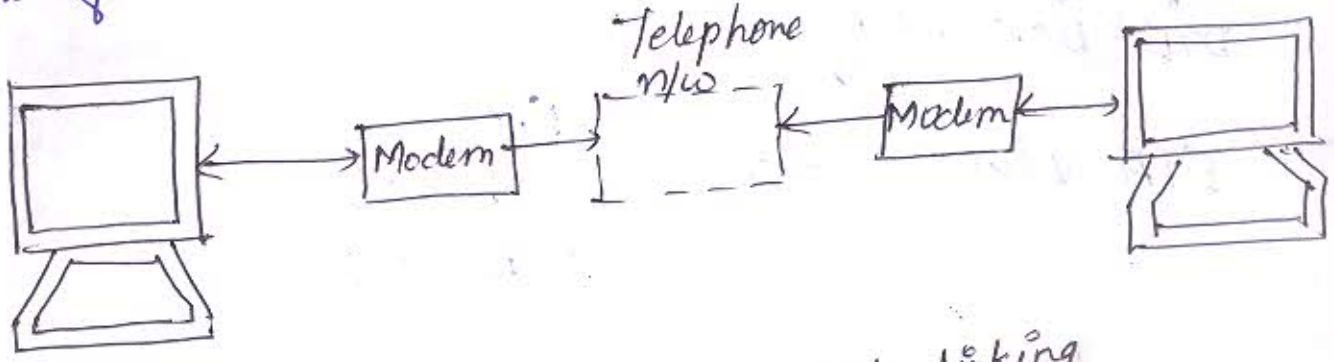


Fig:- Modem - based data linking

DTE-DCE Standards :-

(Data Terminal equipment) - (Data circuit-Terminating Equipment)

→ DTE generates the data and passes them to DCE

→ DCE converts the signal to appropriate formats to the transmission medium and introduces it onto the n/w link.

→ When the signal arrives at the receiving end, this process is reverse.

→ DTE-DCE standards try to define the mechanical, electrical & functional characteristics of the connection b/w DTE & DCE

→ EIA (Electronic Industry association) & ITU-U (International Telecommunication Union - Telecomm^{n} standard committee) are the most active organization have been involved in developing DTE - DCE interface.

→ EIA standards
- EIA-232
- EIA-442
- EIA-449

→ ITU-T standards
- V-series
- X-series.

Section-C

Ques (11):- Explain with the help of block diagram ADSL modem. What type of topology is used when customers in an area used DSL modems for data transfer?

Ans:- ADSL (Asymmetric Digital Subscriber Line) → is a technology for transmitting digital information at a high BW on existing phone lines to homes & business.

→ ADSL provides continously available, "always on" connection.

→ ADSL is asymmetric in that it uses most of the channel to transmit downstream to the user and only a small part to receive information from the user.

→ ADSL simultaneously accomodates analog (voice) information on the same line.

→ ADSL is generally offered at downstream data rates from 512 kbps to about 6 Mbps.

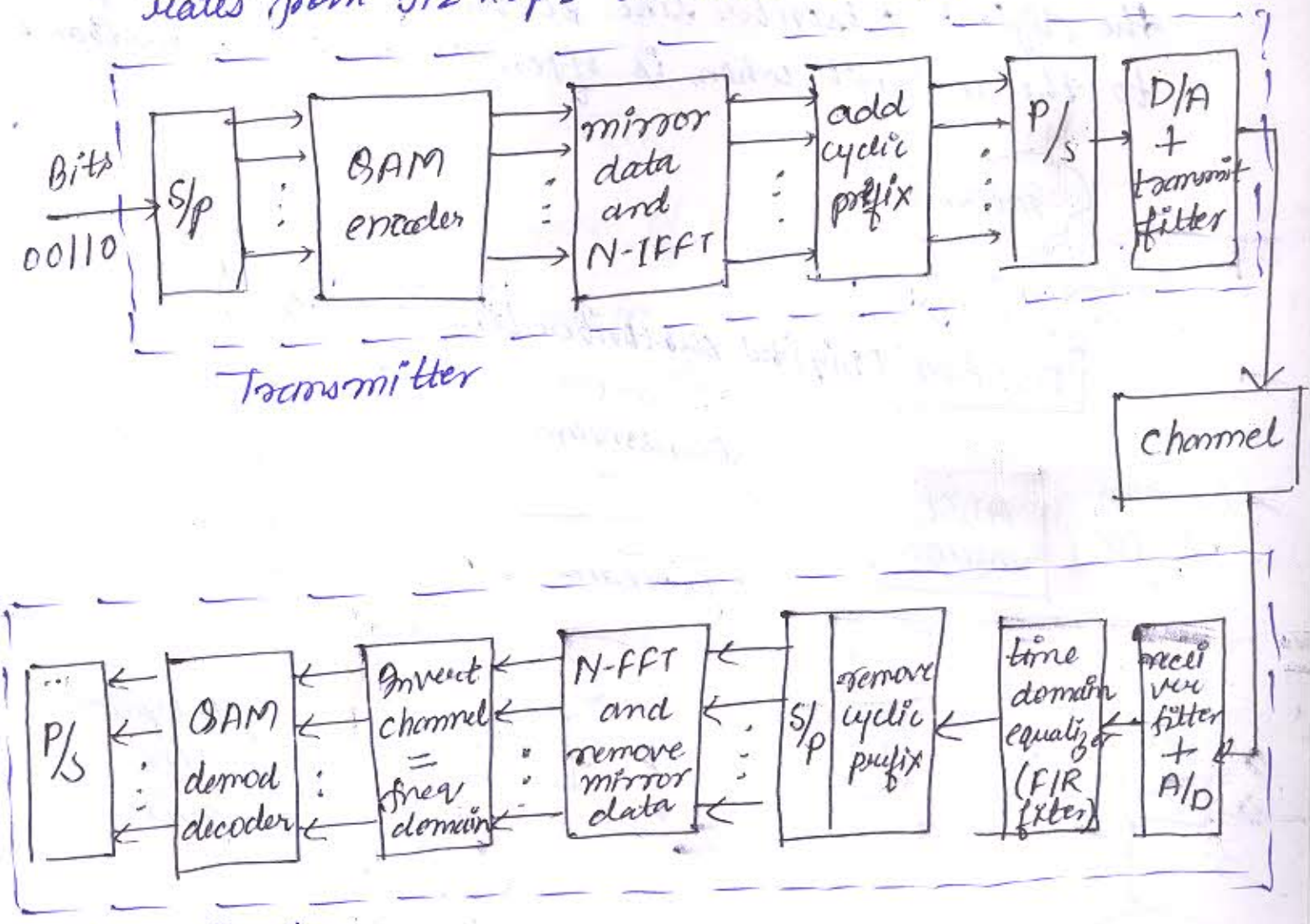


fig:- Block diagram of ADSL modem

Digital Subscriber line (DSL) :- used to transmit digital data over telephone lines.

→ In telecommunication marketing, the term DSL is understood to mean Asymmetric digital subscriber line (ADSL), the most commonly installed DSL technology.

→ DSL uses high freq. bands of data.

→ DSL modem is a device used to connect a computer or router to a telephone line which provides the digital subscriber line service for connectivity to the internet when is often called DSL broadband.

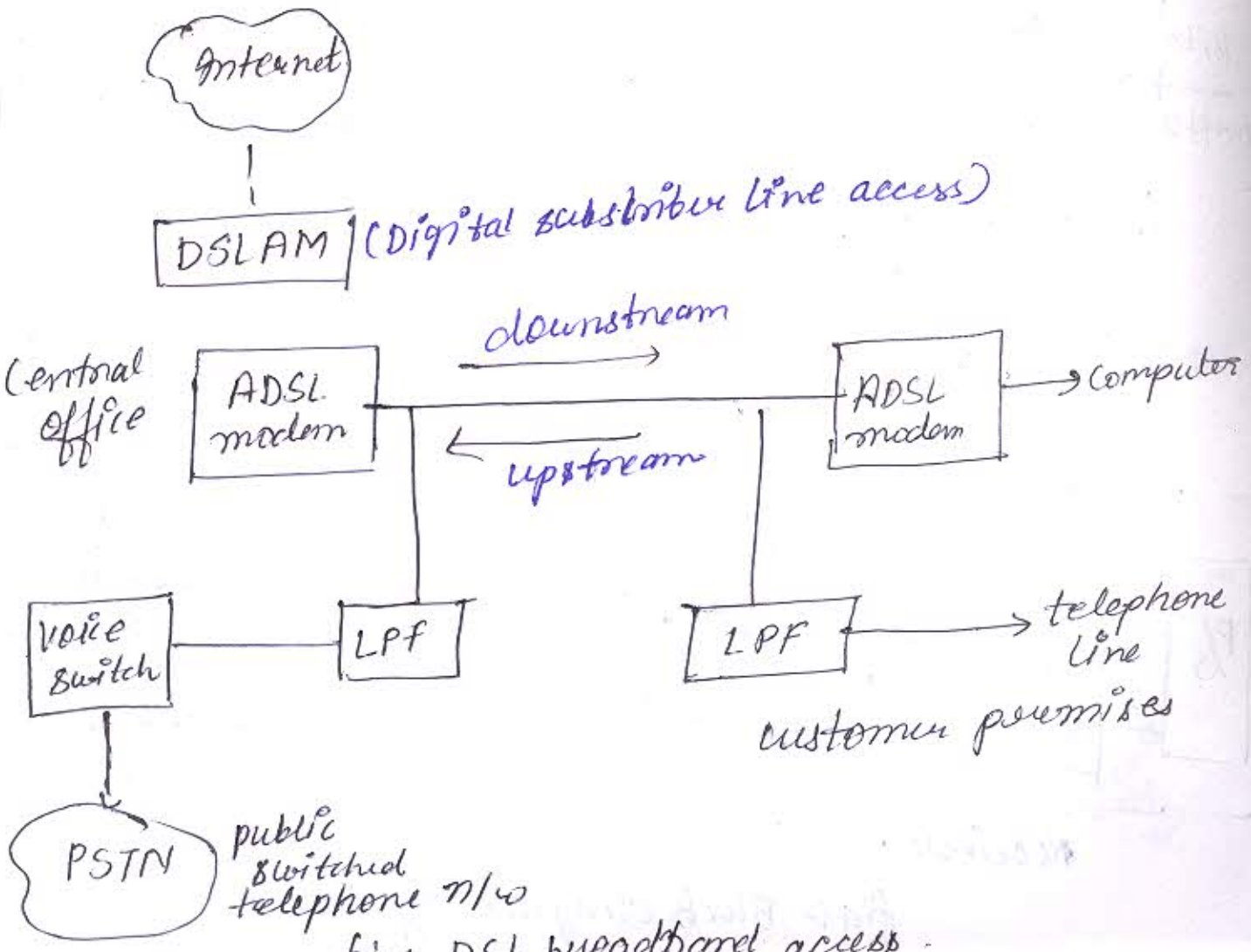


fig:- DSL broadband access.

Ques (12) :- What is differential phase shift keying? What special advantage is obtained using this modulation technique in digital data transmission?

Ans :- DPSK :-

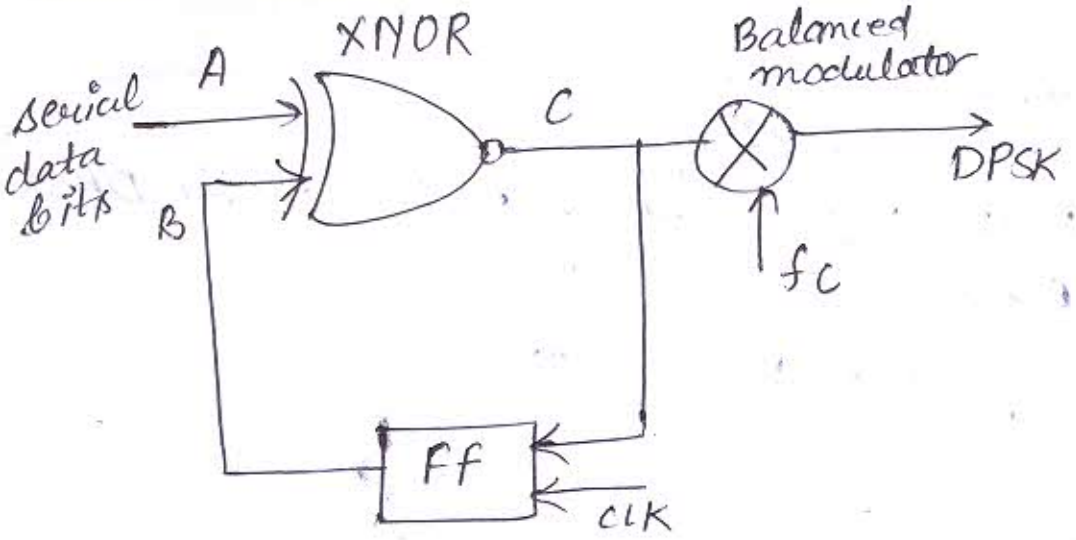


fig :- The scheme of a DPSK modulator

→ DPSK signal is derived in a s/s where the carrier phase reference is replaced with the transmitted signal phase as reference.

→ This can be achieved by using a two i/p logic identity gate (comparator) or Ex-NOR gate with its one i/p fed by bit stream to be transmitted & the other the ~~gate~~ X-NOR gate o/p itself delayed by one-bit.

→ The newly encoded XNOR o/p is now fed to a balanced modulator to obtain the DPSK signal.

→ 1-bit delay of the comparator o/p is obtained by a clocked flip-flop.

Truth table of comparator -

i/p A	i/p B	o/p C
0	0	1
0	1	0
1	0	0
1	1	1

$V_K = +1V$; for binary 1
$= -1V$, for binary 0
which allow a phase shift of 180° in the DPSK o/p for 0 binary.

$DPSK = V_K \cos \omega_c t$

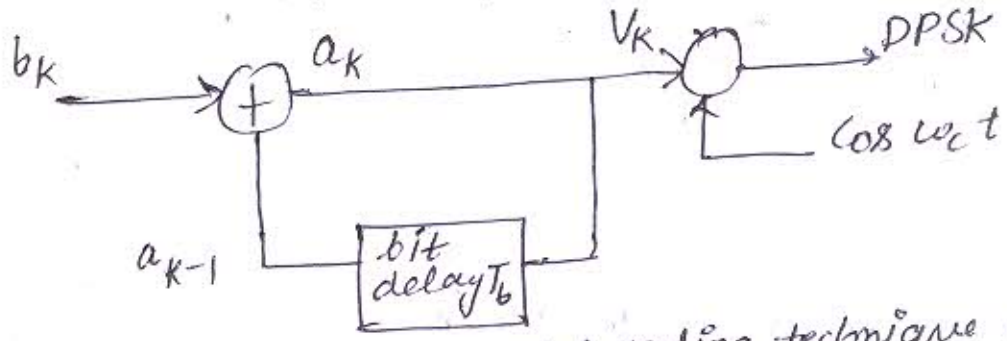


fig:- Differential coding technique using DPSK

Advantages of DPSK :-

→ It has better performance
→ It needs smaller bandwidth
→ It does not need coherent detection
→ DPSK does not need carrier at the receiver