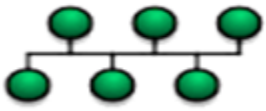
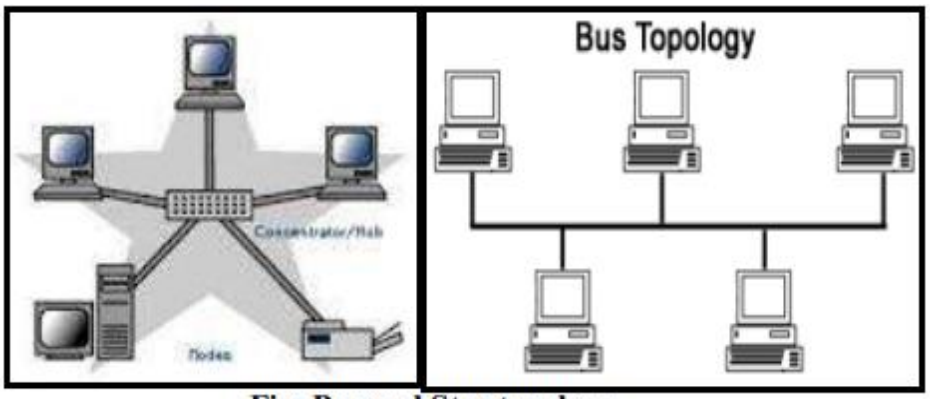
WINTER– 16 EXAMINATION (Subject Code: 17472)

Model Answer

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q.1		**Attempt any SIX of the following**	**12-Total Marks**
	a)	**State advantages of pules modulation over AM.**	**2 M**
	Ans:	• Digital modulation is possible. • PCM is coded form hence it is used for security purpose like military application. • Noise immunity is more. • Good performance of all pulse modulation • Less signal power and cover large communication area. • Transmit modulated signal with low loss. • Avoid interference with other communication. • Make receiving antenna's quite small. • Multiplex signals • Increase channel allocations. • Have better noise immunity.	**Any two, one mark each.**
	b)	**State different frequency bands used in satellite communication.**	**2 M**
	Ans:	L band (1-2 GHz) S band (2-4 GHz) C band (4-8 GHz) X band (8-12 GHz) Ku band (12-18 GHz) Ka band (26-40 GHz)	**Any four ,half marks each.**

c)	**State the need for modulation in a communication system.**	**2 M**
Ans:	• Reduction in the height of antenna • Avoids mixing of signals • Increases the range of communication • Multiplexing is possible • Improves quality of reception	**Any four ,half marks each.**
d)	**What is digital multiplexing. State its types.**	**2 M**
Ans:	Multiplexing is a method by which multiple analog or digital signals are combined into one signal over a common channel. Types: 1. Space-division multiplexing 2. Frequency-division multiplexing 3. Time-division multiplexing 4. Polarization-division multiplexing 5. Code-division multiplexing	**1M** **1M**
e)	**Draw sketches of star and bus topology.**	**2 M**
Ans:	 STAR Topology  Bus topology **OR**  **Fig: Bus and Star topology**	**01 M Each topology**

f) Distinguish between LED and LASER for two points. — **2 M**

Ans: — **Any two** — **One marks each.**

LASER	LED
Monochromatic(single colour wavelength)	Non monochromatic
Collimated (non divergent)	Non collimated.
Coherent	Non coherent
Output power measured in watts.	Output power measured in miliwatts.

OR

Sr. no.	Parameter	LED	LASER
1.	Spectral width	More	Less
2.	Information capacity	Less	More
3.	Temperature dependence	More	Less
4.	Output power	Less	More

g) State the concept of a cell pattern in mobile communication. — **2 M**

Ans: — **02 marks**

In the cellular concept, frequencies allocated to the service are re-used in a regular pattern of areas, called 'cells', each covered by one base station. In mobile-telephone nets these cells are usually hexagonal.
To ensure that the mutual interference between users remains below a harmful level, adjacent cells use different frequencies. In fact, a set of C different frequencies {f1, ..., fC} are used for each cluster of C adjacent cells. Cluster patterns and the corresponding frequencies are re-used in a regular pattern over the entire service area.

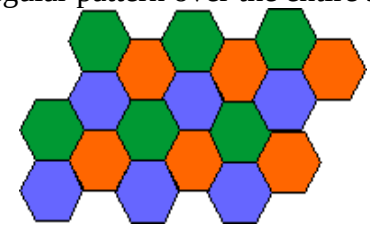


fig:Cluster

Cluster is a group of cell.basically cluster size is c=7

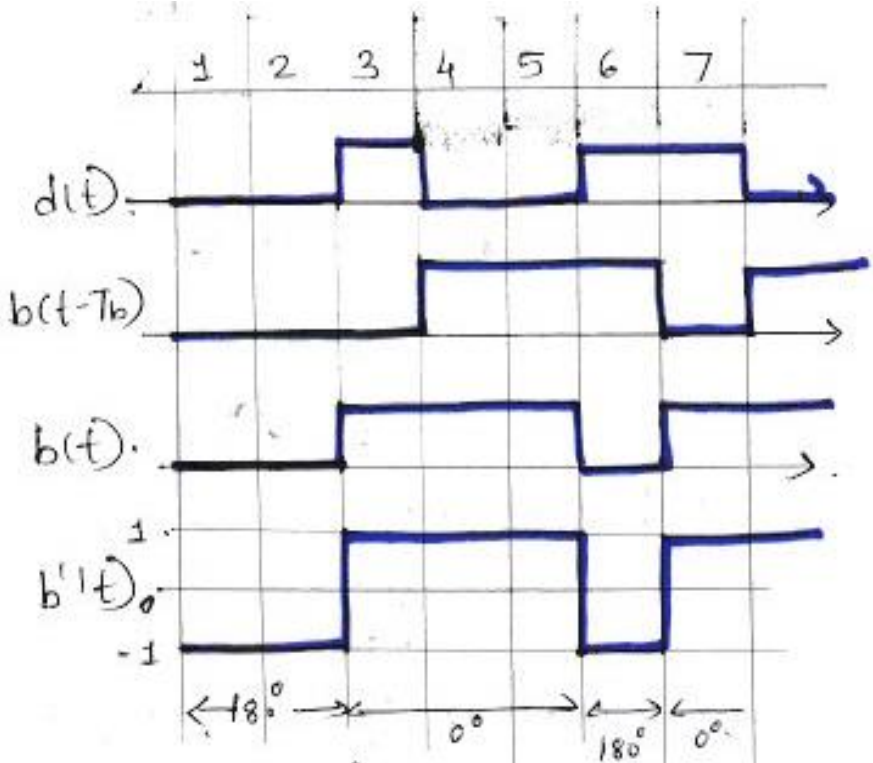
h) Define PM — **2 M**

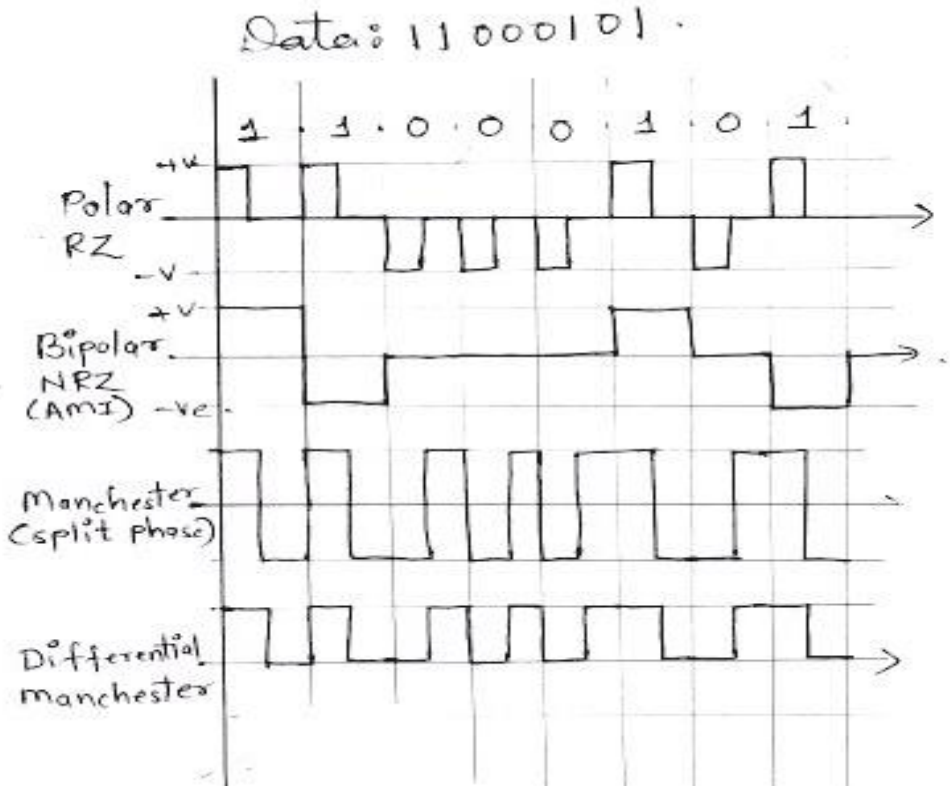
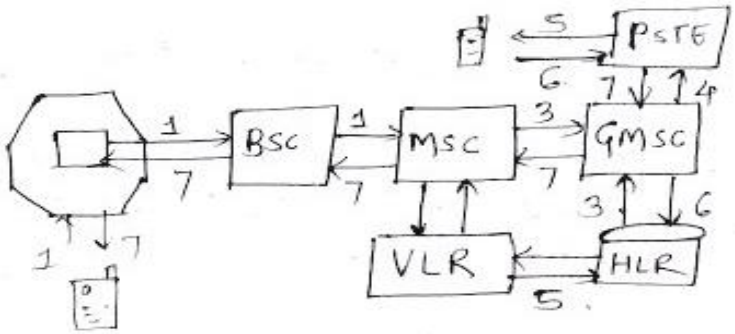
Ans : — **02 marks**

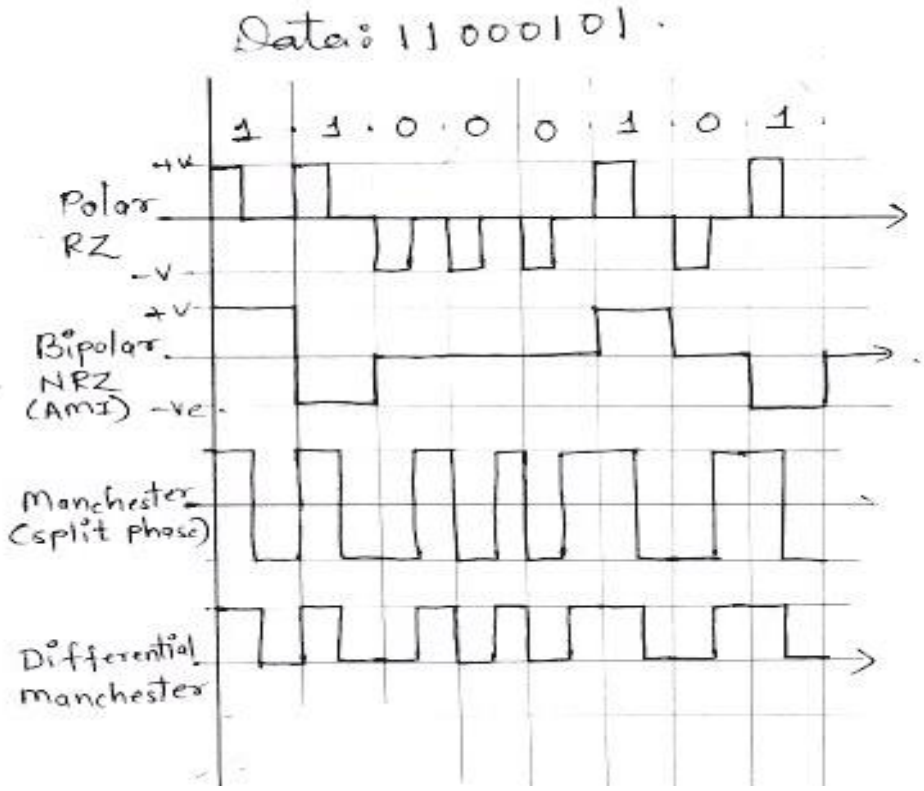
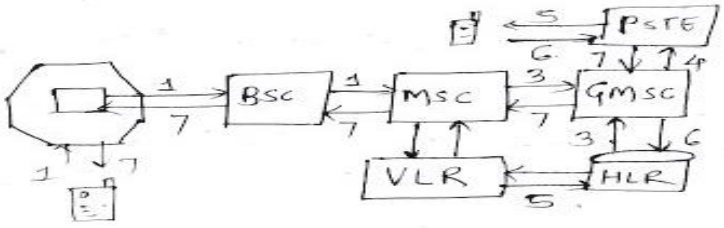
Phase Modulation is the process of modulation in which phase of modulating signal is varying according to the carrier signal by keeping frequency and amplitude constant.

Or

Phase modulation, PM, is used in many applications to carry both analogue and digital signals. Keeping the amplitude of the signal constant, the phase is varied to carry the required information or signal.

b)	**Attempt any TWO of following:**	**8 M**
a)	**State the working principle of DPSK with waveforms.**	**4 M**
Ans:	DPSK Generation:  Working principle:- DPSK does not need a synchronous (or coherent) carrier at the demodulator. The input sequence of binary bit is modified such that the next bit depends upon the previous bit. Therefore in the receiver the previous received bit are used to detect the present bit.  Waveform of DPSK.	**02 marks diagram two marks waveform**

	b)	**Draw the following data formats for bit stream 11000101. 1)Polar RZ. 2) Bipolar NRZ (AMI) 3)Manchester (split phase) 4)Differential Manchester.**	**4 M**
	Ans:		**01 mark each waveform.**
	c)	**State important steps in cellular telephone call processing mobile (celluler) to Mobile (celluler) call procedure.**	**2M**
	Ans:	mobile to mobile call processing Typical signaling sequences for call flow in Gsm 1. Location updating 2. mobile call originating 3. mobile call termination 4. Authentication & Ciphering 5. Inter Msc call handoff. 	**2 marks steps.02 marks diagram.**

Q 2		Attempt any Four of the following	16 M
	a)	**Write the working principle of Uplink model of satelite communication with block diagram.**	**4 M**
	Ans:		**01 mark each waveform.**
	b)	**Describe co-channel and adjacent channel interferance.**	**4 M**
	Ans:	mobile to mobile call processing. Typical signaling sequences for call flow in Gsm. 1. Location updating 2. mobile call originating 3. mobile call termination 4. Authentication & Ciphering 5. Inter Msc call handoff.  **OR** Co-channel Interference is a crosstalk from two different radio transmitters using the same frequency or interference in nearby channels having same frequency Co-channel interference can be avoided by using : 1. proper frequency planning.	**02 marks steps & 02 marks diagram.**

2. Increasing distance between two co-channels Adjacent channel interference:
Interference resulting from signals which are close in frequency to the desired signal is called adjacent channel interference.
The adjacent channel interference can be reduced by
1) Careful filtering
2) Careful channel assignment.
3) adjacent channels in a cell
4) base station will be too close to each other in the frequency domain and this will increase the interference.

c) **Compare FDMA,TDMA,CDMA on basis of the following parameters.** **4 M**
1)Multiplexing Technique 2) Power efficiency 3) Guard band 4) Synchronization

Ans: **1M For Each relevent Point**

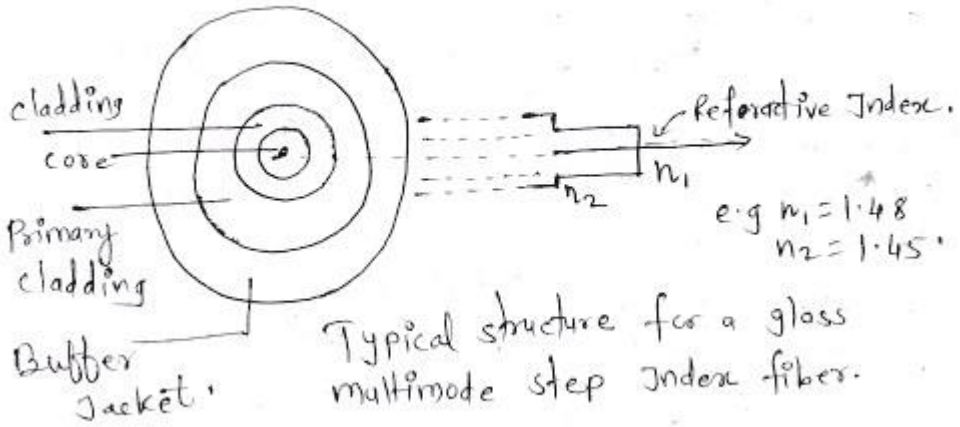
Parameter	FDMA	TDMA,	CDMA
Multiplexing Tech.	frequency	time	Code division
Power efficiency	less	full	full
Synchronization	Not require	require	require
Guard band	Guard band require	Guard time require	Both band require

d) **Draw construction of a multimode steo-Index and describe its working.** **4 M**

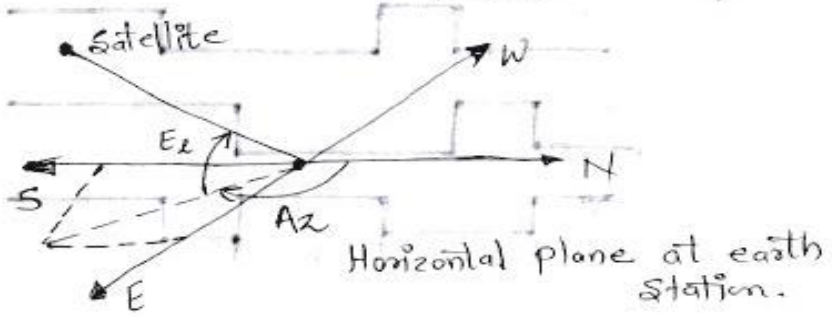
Ans: **02 marks explanation 02 marks diagram.**

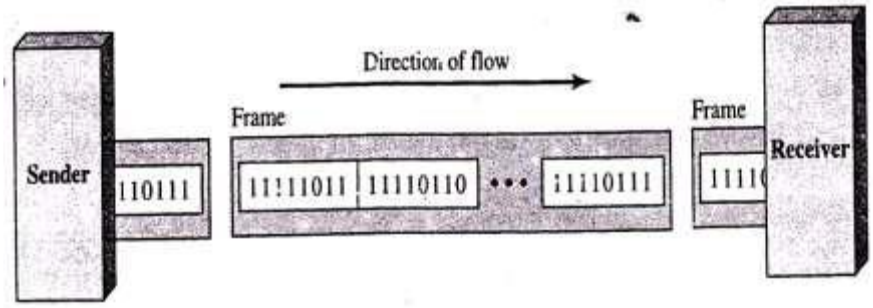
multimode step index may be fabricated from either multicomponent glass compound or doped silica.
The performance characteristics of this fiber type may depends on material used & method of preparation.
Core diameter : 50 to 400 µm
cladding dia : 125 to 500 µm.
Numerical aperture : 0.16 to 0.5.

Multimode step Index fiber.

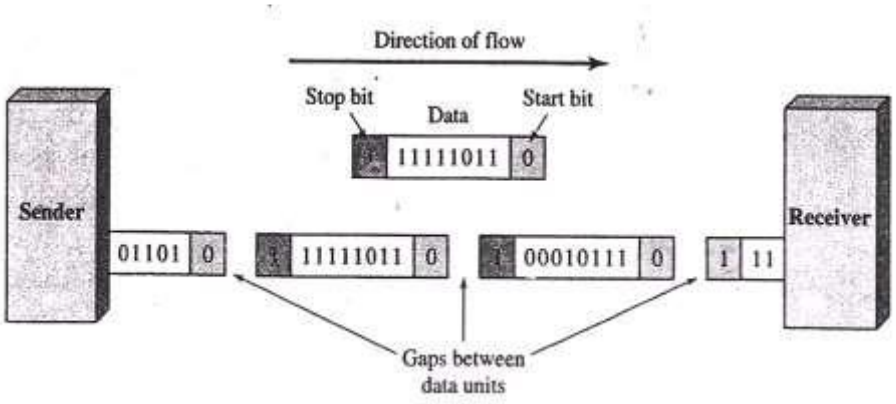


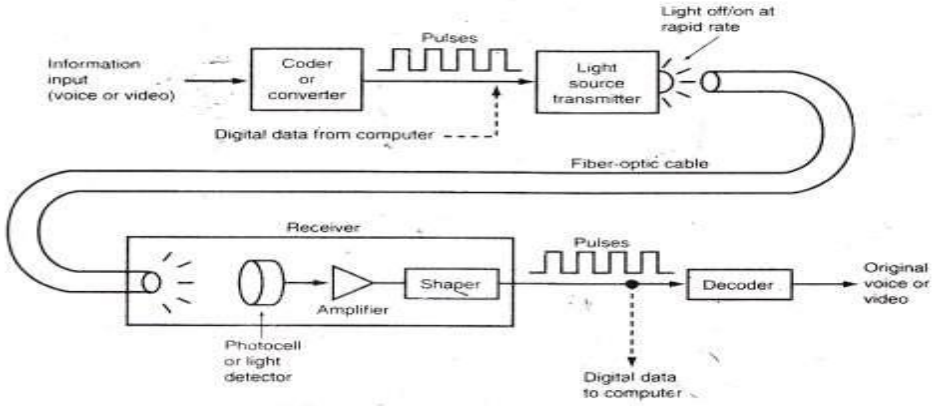
Typical structure for a glass multimode step Index fiber.

	e)	**Define azimuth angle and angle of elevation with respect to satellite communication.**	
	Ans:	Azimuth (Az) & Elevation angle (El). • To maximize transmission & reception, the direction of maximum gain of the earth station antenna, referred to as the antenna boresight, must point directly at the satellite • To align the antenna in this way, two angles must be known. • 1) The azimuth, or angle measured from the true north. 2) The elevation or angle measured from the local horizontal plane.  	**02 marks each.**
	f)	**An AM transmitter transmitsan audio signal of 1.5KHz/3V by using a carrier of 1200 KHzz/5V. Find the sideband frequencies, to modulation.**	**4 M**
	Ans:	+ Am Transmitter transmits an audio signal $f_m = 1.5kHz/3V$ $\therefore f_m = 0.5\ kHz/Volt.$ $f_c = 1200\ kHz/5V.$ $= 240\ kHz/V.$ $USB = f_c + f_m$ $= 240\ kHz + 0.5\ kHz.$ $= 240.5\ KHz.$ $LSB = 240\ kHz - 0.5\ kHz$ $= 239.5\ kHz.$ $\therefore$ USB = 240.5 KHz, LSB = 239.5 KHz — Two sideband for AM.	**02 marks each**

Q. 3		Attempt Any Four of the following	16 M
	a)	**Which error occurs in delta modulation. Which circuit is used to overcome this?**	**4 M**
	Ans:	**Error in Delta modulation:** a)Slope overload b)Granualar error Error can be reduce by variable adaptive or variable steps that is circuit called ADM or Adaptive delta modulation.	**(List of error :2 Mark , Name of circuit: 2Mark)**
	b)	**State what do you mean by sectoring?Why is it used in mobile communication.**	**4 M**
	Ans:	**Cell Sectorization:** One way to increase to subscriber capacity of a cellular network is replace the omni-directional antenna at each base station by three (or six) sector antennas of 120 (or 60) degrees opening. Each sector can be considered as a new cell, with its own (set of) frequency channel(s). **USE in Mobile comunication**: The S/I ratio increases because interference is received from only 1 direction rather than all directions. This makes it possible for cluster size to be reduced, allowing more channels to be allocated to each cell.	**(Cell Sectorization: 2Mark, USE in Mobile comunication:2 Mark)**
	c)	**With the help of a neat diagram give working of serial data transmission mode.**	**4 M**
	Ans:	In serial data transmission there are two basic transmission mode synchronous and Asynchronous transmission . In serial transmission one bit is transmitted simultaneously **Synchronous data transmission:** The technique of transmitting each data word one after another without start and stop bits is referred as synchronous data transmission. In synchronous transmission, the bit stream is combined into longer flames which may contain multiple bytes .Each byte, however, is introduced onto transmission link without a gap between it next one. If is left to the receiver to separate the stream into bytes for decoding purposes.  **Asynchronous data transmission:** In asynchronous communication each data word is accompanied by stop and start bits that identify the beginning and end of the word. In this, the start bits are 0's the stop bits are 1's and the gap is represented by an idle line rather than by	**(Each mode: 1 Mark)**

additional stop bits.
□□The addition of stop and start bits and insertion of gaps into the bit stream make asynchrous transmission slower
than forms of transmission.
□□But it is cheap and effective.



d)	**Draw a neat block diagram of standard fiber optic communication and explaineach block function.**	**4 M**
Ans:	 1. In the transmitter, the light source can be modulated by digital or an signal. 2. The voltage to current converter serves as an electrical interface berween the input circuitary and light source. 3. Light source is either infrared light emitting diode(LED0 or an injection laser diode (ILD). 4. The amount of light emitted by either an LED or ILD is proportional to the amount of drive current. 5. Thus, the voltage to current converter converts an input signal voltage to current that is used to drive the light source. 6. The light outputted by the light source is directly proportional to the magnitude of the input voltage. 7. The source to fiber coupler is a mechanical interface. It's function is to couple light emitted by the light source into the optical fiber cable. 8. The optical fiber consists of a glass or plastic fiber core surrounded by a cladding and then encapsulated in a protective jacket. 9. The fiber to light detector coupling device is also a mechanical coupler.	**(Diagram:2 Mark,Explaination:2 Mark)**

10. It's function is to couple as much light as possible from the fiber cable into the light detector.
11. The light detector is generally a PIN diode or phototransistor.
12. All three of these devices convert light energy to current.
13. The current to voltage converter is required to produce an output voltage proportional to the original source information.

e) State electrical characteristics of RS-232 standard. **4 M**

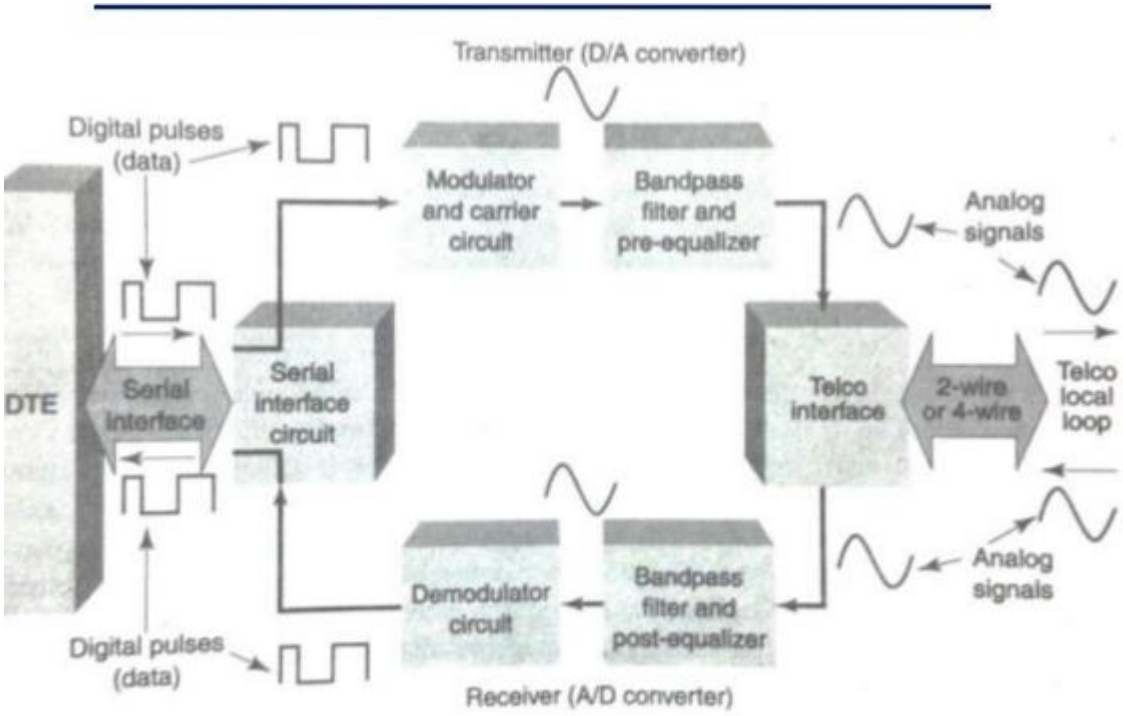
Ans:

	Data Signals		Control Signals	
	Logic 1	Logic 0	Enable (On)	Disable (Off)
Driver (output)	−5 V to −15 V	+5 V to +15 V	+5 V to +15 V	−5 V to −15 V
Terminator (input)	−3 V to −25 V	+3 V to +25 V	+3 V to +25 V	−3 V to −25 V

(Data:2 Mark, Control Signal:2 Mark)

f) Draw block diagram of modem and write function of each block. **4M**

Ans:



- **Data Communication Modem Block Diagram**

Modem is modulator and Demodulator combination in same equipment which use to connect analog and digital data with telephone and computer interface for internate purpose

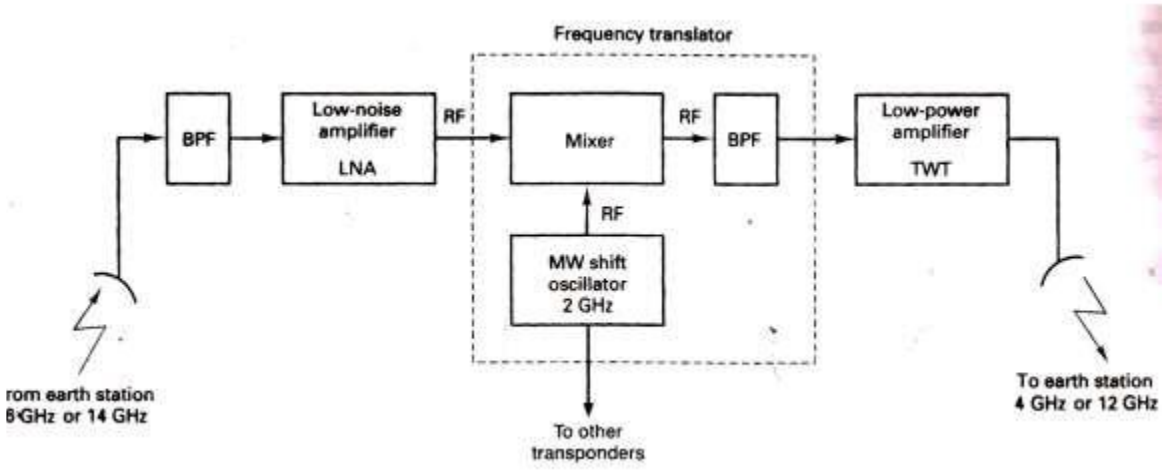
DTE:Data terminal Equipment like computer. Data to be transmitted are transferred to a modem from Data terminal equipment.

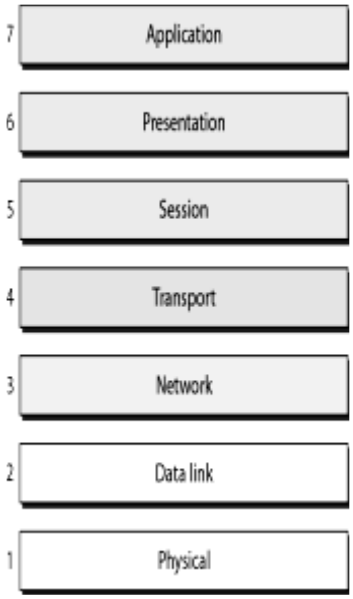
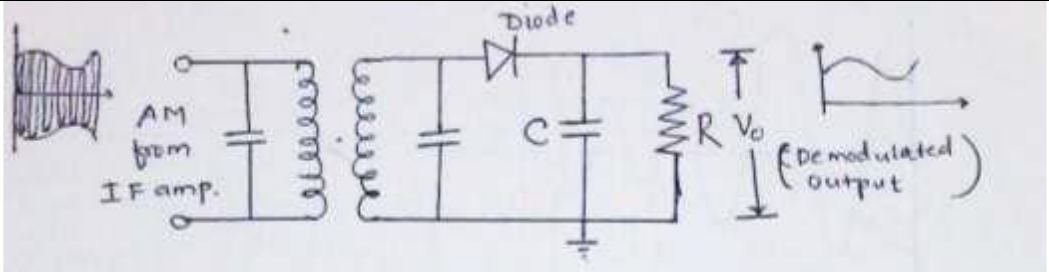
Serial Interface: Serial data will be send demodulator or receive from modulator block

Band pass Filter: received data and Transmitted data is passed trough different band pass filter to remove environmental noise

2/4 wire: depending received or transmitted data is converted to two or four wire

(Diagram:2 Mark,Function:2 Mark)

		configuration. **OR** (DTE) (e.g. a computer). The modem usually has Intermediate frequency (IF) output (that is, 50-200 MHz), however, sometimes the signal is modulated directly to L-band. In most cases frequency has to be converted using an up converter before amplification and transmission. A modulated signal is a sequence of symbols, pieces of data represented by a corresponding signal state, e.g. a bit or a few bits, depending upon the modulation scheme being used. Recovering a symbol clock (making a local symbol clock generator synchronous with the remote one) is one of the most important tasks of a demodulator. Similarly, a signal received from a satellite is firstly downconverted (this is done by a Low-noise block converter - LNB), then demodulated by a modem, and at last handled by data terminal equipment. The LNB is usually powered by the modem through the signal cable with 13 or 18 V DC.	
Q. 4		**Attempt any FOUR of following:**	**16 M**
	a)	**Write the working principle of transponder with the help of block diagram.**	**4 M**
	Ans:	 **Explaination:** A typical satellite transponder consists of an input band limiting device (BPF), an input low-noise amplifier (LNA), a frequency translator, a low-level power amplifier, and an output BPF. The input BPF limits the total noise applied to the input of the LNA. The output of the LNA is fed to a frequency translator (a shift oscillator and a BPF), which converts the high-band uplink frequency to the low0band downlink frequency. The low-level power amplifier, which is commonly a travelling wave tube, amplifies the RF signal for transmission through downlink to earth station receivers. Each RF satellite channel requires separate transponder	**(Diagram:2 Mark,Explaination:2 Mark)**
	b)	**Define the term hand off. Give Steps involved in hand off process. State its types.**	**4 M**
	Ans:	**Handoff:** Cellular system has the ability to transfer calls are already in progress from one cell-site controller to another as the mobile unit moves from cell to cell within the cellular network. The transfer of a mobile unit from one base stations control to another base stations control is called a handoff. **Steps involved in handoff process are:** • Initiation • Resource reservation	**Define-1M,Steps:1 M,Types:2 M**

		• Execution • Completion **Types of handoff are:[any other handoff can also be credited marks]** 1. Soft handoff 2. Hard handoff 3.Delayd handoff 4.Queded handoff 5. Forced handoff.	
	c)	**Draw the OSI model and state the function of each layer only.**	**4 M**
	Ans:	**Ans:**  **Function of each Layer:** • **Physical Layer** : To transmit bits over medium. To provide electrical and mechanical Specifications. • **Data Link Layer**: To organize bits to frame .To provide hop to hop delivery. • **Network Layer**: To move packets from source to destination .To provide internetworking. • **Transport Layer**: To provide reliable process to process message delivery and error recovery • **Session Layer**: To establish manage and terminate session. • **Presentation Layer**: To translate encrypt and compress data • **Application Layer** :To allow access to network resources	**(Correct diagram:2 Mark, Each for writing function of layers:2 Mark)**
	d)	**Draw circuit diagram of AM detector. State the function of each component.**	**4 M**
	Ans:	 	**(Diagram:2 Mark,Explaination:2 Mark)**

* C is a small capacitance and R is large resistance
* Parallel combination of R and C is the load resistance across which output is developed
* For each positive half cycle of input RF, carrier signal, diode is forward biased and capacitor C charges up to peak voltage Vs. of input signal.
* Between peaks of positive half cycle of input cycle, capacitor discharges through R. again for next positive half cycle C starts charging.
* As a result of this voltage Vo is a modulating signal with RF ripples.
* Time constant RC, while discharging of capacitor should be slow enough to keep RF ripple as small as possible ,but sufficient fast for detector circuit to follow fastest modular variations.

e) Compare ASK,FSK,PSK on basis of — **4M**

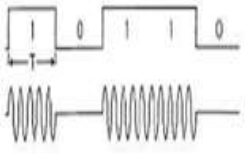
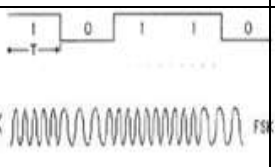
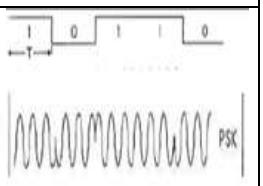
1) Waveform

2) Variable Parameter

3) Noise Immunity

4) BW required

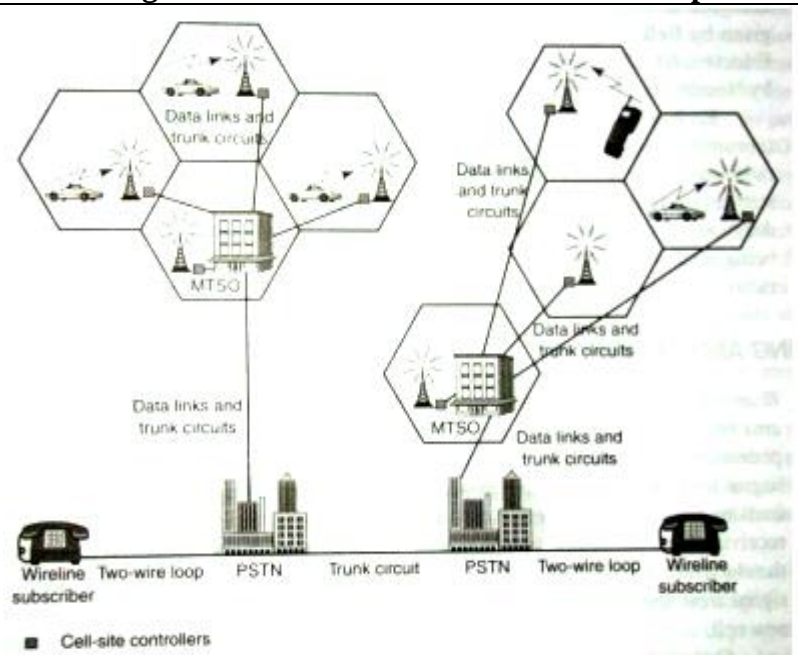
Ans: Compare ASK, FSK and PSK. — **(Each Point :1 Mark)**

Parameter	ASK	FSK	PSK
Variable	Amplitude	frequency	Phase
bandwidth	(1+r)R R= bit rate,r=1	4fb	fb
Noise immunity	less	more	more
waveform			

f) State advantages of optical fiber cable over conventional cables — **4M**

Ans: (Additional point may be consider — **(Each Point: ½ Mark)**

- High Bandwidth
  1. Light weight and small diameter
  2. Low Losses
  3. Less number of repeaters
  4. Immune to electromagnetic interference
  5. High degree of data security
  6. Noise is comparatively less in optical communication
  7. Lower attenuation
  8. Transmission cost per bit is low
  9. Controlled dispersion gives low error rate

Q.5		Attempt any FOUR of following:	16 M
	a)	**State sampling Theorem and Nyquist rate.**	4 M
	Ans:	**SAMPLING THEOREM (2M)** Sampling theorem: State that the sampling frequency (Fs) i.e. number of sample per second should be greater than or equal to twice the maximum frequency component (Fm) of the input signal. Fs $\geq$ 2 Fm **OR** Sampling theorem states that a band limited signal of finite energy having the highest frequency component FmHz can be represented and removed completely from a set of samples taken at a rate of Fs sampling per seconds provides that Fs $\geq$ 2Fm **NYQUIST RATE (2M)** The minimum sampling rate required to sample an analog signal to avoid Aliasing effect is given by the Nyquist Rate. It is given by **Nyquist rate** :Fs=2Fm it is called as Nyquist rate	**(Each point:2 Mark)**
	b)	**State advantages ,disadvantages and application of PCM.(2 each)**	4 M
	Ans:	**Advantages: ANY 2** 1. PCM has very high noise immunity. 2. Repeaters can be used between the transmitter and the receiver which can further reduce the effect of noise. 3. It is possible to store the PCM signal due to its digital nature. 4. It is possible to use various coding techniques so that only the desired receiver (user) can decode the message. **Disadvantages: ANY 2** 1. The encoding decoding & quantizing circuitry of PCM is complex. 2. PCM requires a large BW as compared to other systems. **Applications ANY 2** 1. It is used in telephony. 2. PCM is used in space communication where a spacecraft transmits signals to the earth. Due to high noise immunity, PCM systems can be used for such applications.	**(Advantages: 1 Mark, Disadvantages: 1 Mark, Applications:2 Mark)**
	c)	**Draw the schematic diagram of a mobile communication and explain its working.**	4 M
	Ans:		**(Diagram:2 Mark,Explaination:2 Mark)**

Explanation:-
Fig shows a mobile or cellular telephone system that includes all the basic components necessary for mobile communication.
The radio network is defined by a set of radio frequency trans receiver located within each of the cells. The location of these radio frequency trans receivers are called base station.
Base station: base station serves as central control for all users within that cell.
Mobile unit communicate directly with the base stations & the base stations communicate directly with a mobile.
Telephone switching office (MTSO):-An MTSO controls channel assignment, call processing, call setup & call termination which includes signaling switching, supervision & allocating radiofrequency channels. The MTSO provides a centralizes administration & maintenance point for the entire network & interfaces with the public telephone network over wire line voice trunks & data links.

d) State function of hubs, repeaters, bridges, routers. **4 M**

Ans: **(Each: 1Mark)**

Hub: -
A Hub is a connecting device. It is actually a multiport repeater. It is normally used to create connections between terminals in a physical star topology.
Repeater:
It is a networking device also called regenerator. It works at the physical layer of OSI protocol. Signal travelling across a physical wire travel some distance before they become weak or get corrupted. A repeater receives such a signal and regenerates it.
Bridge:
A device that connects two local-area networks (LANs), or two segments of the same LAN. The two LANs being connected can be alike or dissimilar. For example, a bridge can connect an Ethernet with a Token-Ring network. Unlike routers, bridges are protocol -independent. They simply forward packets without analyzing and re-routing messages. Consequently, they're faster than routers, but also less versatile.
Router: -
A Router operates at the physical, data link and network layer of OSI model. A router is useful for interconnecting two or more networks. These networks can be heterogeneous. Which means that they can differ in their physical characteristics such as frame size, transmission rates, topologies, addressing etc.

e) Compare Synchronous data transmission and Asynchronous data transmission on the basis of: **4 M**

i) Techniques used

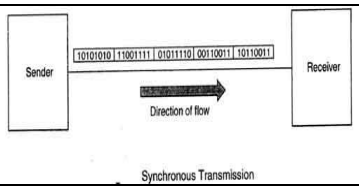
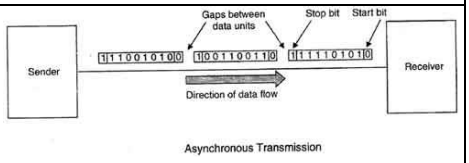
ii) Synchronization

iii) Example

iv)Application

Ans: **(1Mark each)**

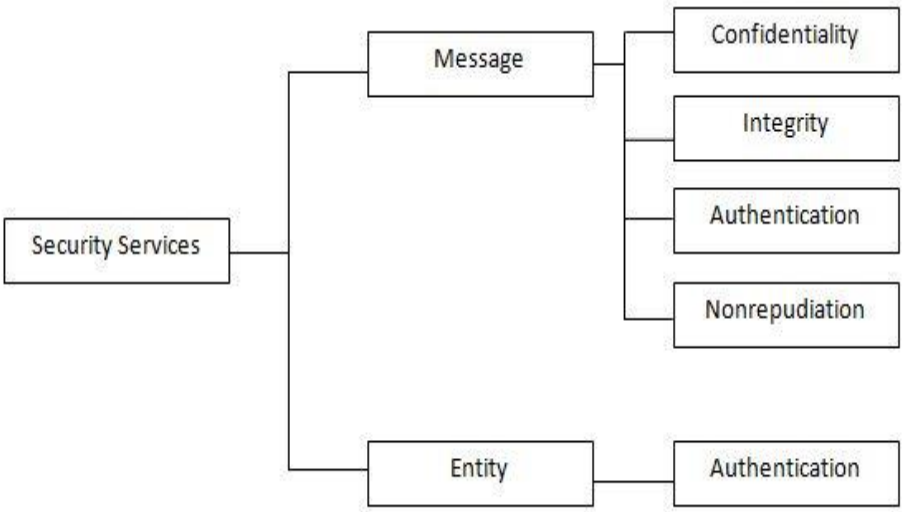
Sr. No		Synchronous	Asynchronous
1	**Techniques used**	Here the bits which are being transmitted are synchronized to a	In asynchronous transmission the transmitter commences transmission of data byte at any

		reference clock.	instant of time	
2	**Synchronization**	Required	Not required	
3	**Example**	 Synchronous Transmission	 Asynchronous Transmission	
4	**Application**	Synchronous transmission is used for high speed communication between computers.	Data entry from the keyboard.	

f) **State the security services related to message and entity.**
State the significances of each

Ans: Message Confidentiality, Message Integrity, and Message Authentication, message Nonrepudiation, Entity Authentication. **(State : 1 Mark, Significance :3Mark)**

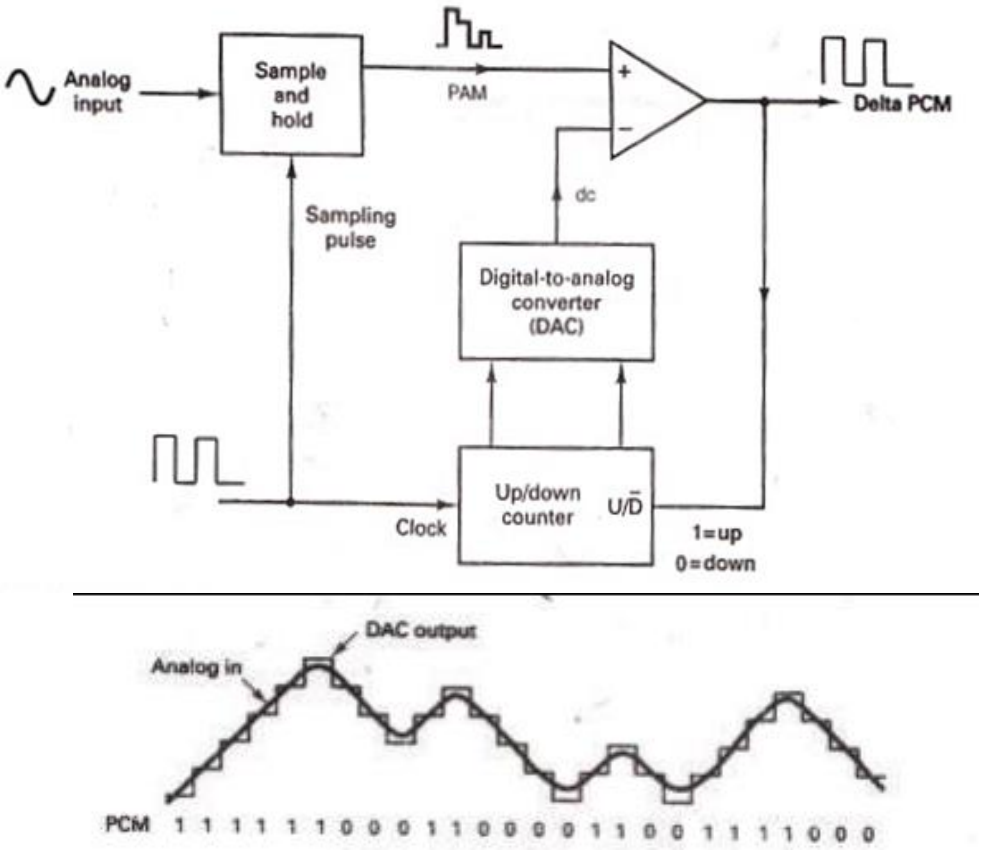
OR

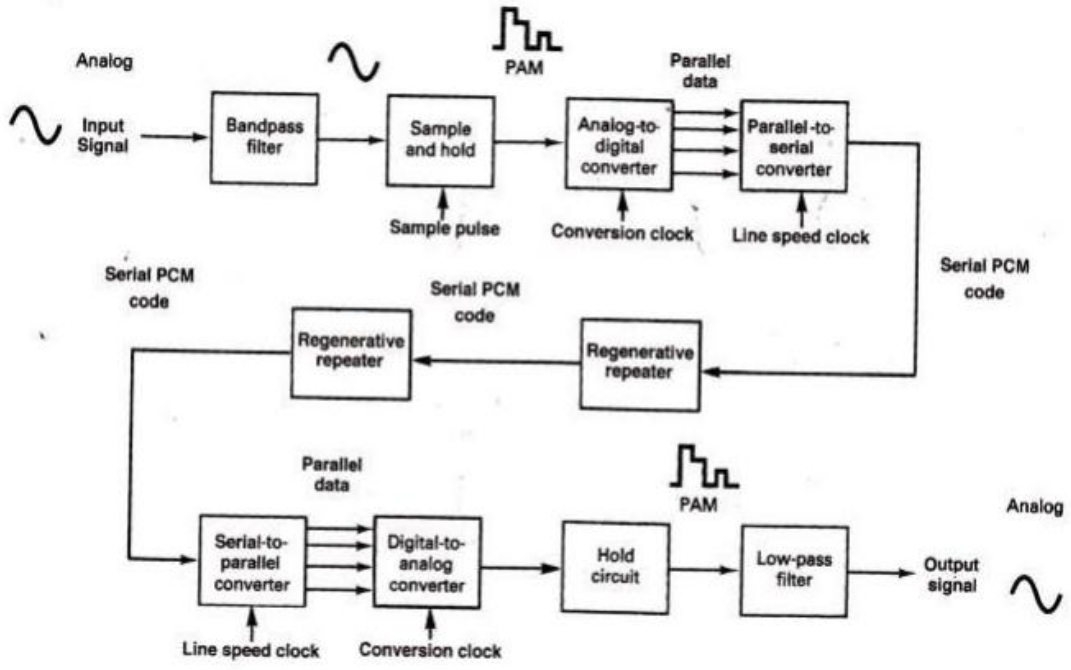


Message Confidentiality: Message Confidentiality or privacy means that the sender and the receiver expect Confidentiality. The transmitted message must make sense to only the intended receiver. To all others, the message must be garbage. When a customer communicated with her bank, she expects that communication is totally confidential.

Message Integrity: Message Integrity means that the data must arrive at the receiver exactly as they were sent. There must be no changes during the transmission, neither accidentally nor maliciously. As more and more monetary exchanges occur over the internet, integrity is crucial. For example, it would be disastrous if a request or transferring $10,000 or $ 100,000 The integrity of the message must be preserved in a secure communication.

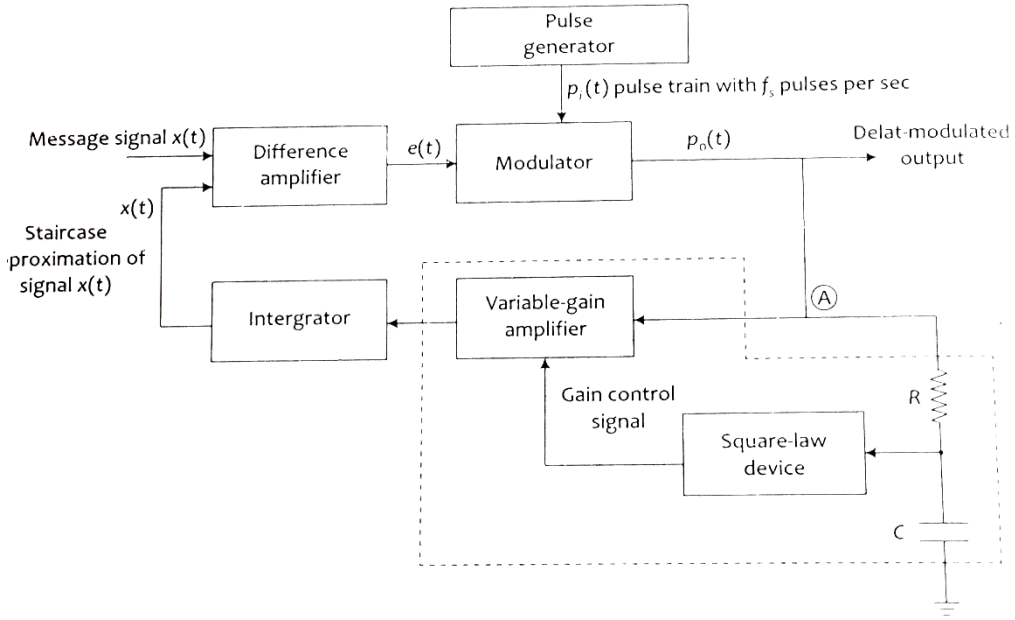
Message Authentication: Message Authentication is a service beyond message integrity. In message authentication the receiver needs to be sure of the senders identity and that an imposter has not sent to the message.

		Message Nonrepudiation: Message Nonrepudiation means that the sender must not be able to deny sending a message that he or she, in fact, did send. The burden of proof falls on the receiver. For example when a customer sends a message to transfer money from one account to another, the bank must have proof that the customer actually requested that transaction. **Entity Authentication**: In Entity Authentication (or user identification) the entity or the user is verified prior to access to the system resources (files for example). For example a student who needs to access her university resources needs to be authenticated during the logging process. This is to protect the interests of the university and the student.	
Q.6		**Attempt any FOUR of following:**	**16 M**
	a)	**Explain the working of Delta modulation with the help of diagram.**	**4 M**
	Ans:	 **DM Working**: • The input analog is sampled and converted to PAM signal, which is compared with the output of the DAC. The output of the DAC is a voltage equal to the regenerated magnitude of the previous sample, which was stored in the up-down counter as a binary number. • The up-down counter is incremented or decremented depending on whether the previous sample is larger or smaller than the current sample. • The up-down counter is clocked at a rate equal to the sample rate. Therefore the up-down counter is updated after each comparison.	**(Diagram:2 M, Working:2 M)**

		• Initially the up-down counter is zeroed and DAC output is 0v. • The first sample is taken and converted to a PAM signal, and compared with zero volts. The output of the comparator is a logic 1 condition (+v), indcating that the current sample is larger in amplitude than the previous sample. • On the next clock pulse, the up- down counter is incremented to a count of 1.The DAC now outputs a voltage equal to the mgnitude of the minimum step size (resolution). The steps change at a rate equal to the clock frequency (sample rate). Consequently, with the input signal shown, the up-down counter follows the input analog signal up until the output of the DAC exceeds the analog sample; then the up-down counter will begin counting down until the output of the DAC drops below th sample amplitude. In the idealized situation the DAC output follows the input signal. Each time the up-down counter is incremented, a logic 1 is transmitted, and each time the up-down counter is decremented, a logic 0 is transmitted.	
b)	**Define numerical aperture and acceptance angle.**		**4 M**
Ans:	**Numerical Aperture**: This parameter determines the quantity of light coupled from source to fiber from various angles OR Numerical Aperture represents a figure of merit used to find light gathering capability of fiber from various angles **Acceptance angle:** The maximum value of incident angle for which the incident light can propagate through the fiber to the far end is called the acceptance angle.		**(Numerical Aperture: 2Mark, Acceptance angle: 2Mark)**
c)	**Describe the working of PCM with block diagram.**		**4 M**
Ans:	 **Fig. Block diagram of PCM transmitter**	**(Working: 2Mark, Diagram :2Mark)**

Working:

- Fig shows the block diagram of a single channel PCM transmitter.
- The function of a sampling circuit in a PCM transmitted is to periodically sample the analog input voltage & convert those samples to a series of constant amplitude pulses that can converted to binary PCM.
- For the ADC to accurately convert a voltage to a binary code the voltage must be relatively constant so that ADC can complete conversion before the voltage level changes, otherwise the ADC will not stabilized on any PCM code.
- Sampling can be done by using two techniques:
  - Natural sampling
  - Flat top sampling
- The purpose of a sample and hold circuit is periodically sample the changing analog input voltage and convert those samples to a series of constant amplitude PAM voltage levels.
- The ADC convert the sample voltage to a PCM code.
- PCM code is transmitted serially after converting the PCM code in the serial form by a parallel to a serial convertor.

d)	**Describe the working of Adaptive delta modulation with block diagram.**	**4 M**
Ans:		**(Working: 2 Mark, Diagram :2 Mark)**

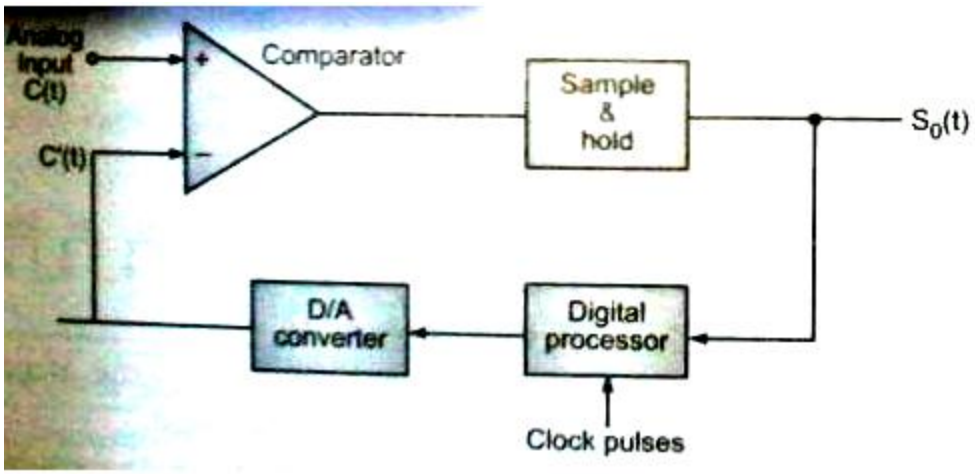
The step size δ is varied by controlling the variable-gain amplifier which is assumed to have a low gain when the control voltage is zero and a large gain when the control voltage increases. The gain-control circuit consists of an *RC* integrator and a square-law device

- Pulse generator produces narrow pulses of fixed amplitude at a rate equal to the

desired sampling rate. The modulator consists of hard limiter and a product device/multiplier.

- Whatever be the actual value of e(t) the hard limiter output will be +1 if e(t) is positive and -1 if e(t) is negative. So the polarity of $p_o(t)$ depends on the sign of e(t).
- The subsystem within a dotted line box is for adaptation.
- When the input signal is constant or slowly varying, DM signal will be hunting and the modulator output will be a sequence of alternate polarity pulses, there will not be any charge on the capacitor and the voltage across it will be zero.
- So the gain control is voltage is almost zero and there will not be any change in the amplitude of the pulses at the output of the variable gain amplifier. As the gain of this amplifier is adjusted initially to be low when the gain control voltage level is zero we have thus ensured that the step size is small when x (t) is almost constant or changing very slowly and thus, granular noise is reduced as shown in Figure.
- Now if x (t) is steeply rising or falling for some time the consecutive pulses in the pulse train will either be all positive or all negative. So the capacitor will be charged irrespective of whether it is positively charged or negatively.
- Due to the squaring device (square law device), the amplifier gain will be increased no matter what the polarity of the capacitor voltage is. The net result is an increase in step size and a reduction in slope-overload distortion.

OR



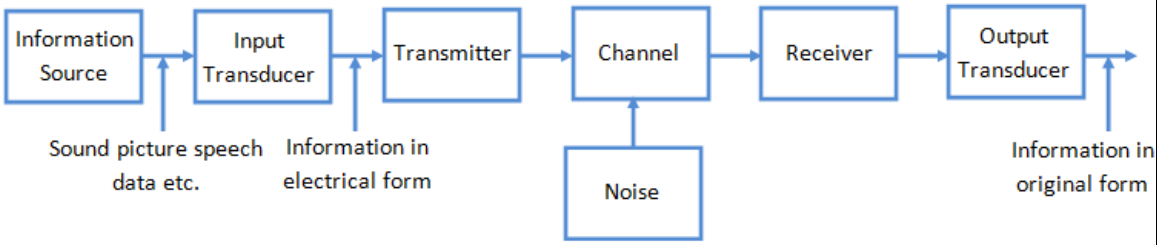
Working

In response to the K^{th} pulse processor generates a step which is equal in magnitude to the step generated in response to previous i.e $(k-l)^{th}$ clock pulse . if c(t)<c'(t) the processor will increase the step size by 'δ' . if c(t)>c'(t) the processor will decrease the step size by 'δ'

The comparator compares the analog input c(t) and approximated signal c' (t) generated by the digital to analog converter . The sample and hold circuit holds of comparator which is ADM signal.

e) Draw and explain block diagram of a basic communication system. **4M**

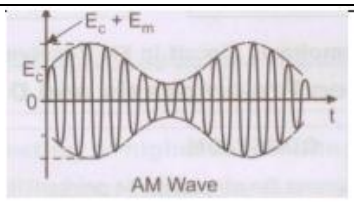
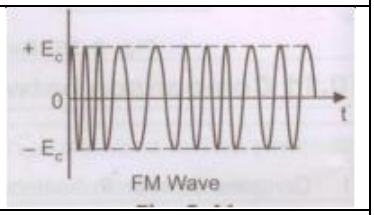
Ans: **(Diagram:2 Mark,Explaination:2 Mark)**



1) Input Signal: The information can be in the form of sound, picture or data coming from computer.
2) Input Transducer: It converts original information into equivalent electrical signal.
3) Transmitter: It converts electric equivalent into suitable form. It increases the power level of signal so that it can cover long distance.
4) Communication channel:-It is medium used for transmission of electromagnetic e.g. from one place to another. It can be wire or optical fibre or free space.
5) Noise: It is unwanted signal which gets added in transmitting signal.
6) Receiver: the received signal is demodulated &converted back to suitable form.
7) Output transducer: It converts electrical signal into original form.

f) Compare AM and FM on basis of

Ans: **(Each point:1 M)**

	AM	**FM**
Technique	The **amplitude** of the carrier wave is varied in proportion to the waveform being transmitted.	The **Frequency** of the carrier wave is varied in proportion to the waveform being transmitted.
Waveform		
Bandwidth	2fm	2(δ + fm(max))
Noise Immunity	Less	More