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.

Q1.(A) Attempt any SIX: **12M**

(a)State two advantages and disadvantages of PWM.

ANS**:** **(1/2 mark for each advantage and disavantage of PWM)**

Advantages :1)More immune to Noise

2)Synchronisation between transmitter and receiver is not required.

Disadvantages: 1)Transmitter require large power.

2) Require large bandwidth

Note:- [any other logical advantage and disadvantage can be accepted]

b) Define footprint and station keeping in satellite communication.

ANS**:(Each defination 1M)**

i) Footprint: The **footprint** of a communications satellite is the ground area that its transponders offer coverage, and determines the satellite dish diameter required to receive each transponder's signal

ii) **Station keeping**: The control signals that are to be generated on ground to keep the satellite in position is called station keeping

c) Calculate the power in AM signal for the modulation of (a) 100% and (b) 50%.

ANS: **(1M each power)**

Power In AM at 100 % and 50% modulation:

a) Ma = 1

$P_t = P_C \left(1 + \frac{ma2}{2}\right)$

$P_t = P_C(1+ \frac{1}{2})$

$P_t = P_c (\frac{3}{2})$

$P_t = 1.5\, P_C$

b)Ma =50% = $\frac{50}{100}$

Ma =0.5

$P_t = P_C (1+ \frac{(0.5)2}{2}) = P(1+\frac{(0.25)}{2})$

$= P_C (2+\frac{(0.25)}{2})$

$= P_C (\frac{2.25}{2})$

$P_t = 1.125\, P_C$

d) State two advantage and two disadvantage of FDM.

ANS: (**Advantages 1M, Disadvantages 1M)**

Advantages : 1). Very simpler to important

2). Used for analog Signal.

Disadvantages : 1) Large Bandwidth Require

2) Used at Low speed channel

3) Low Rate

e) Draw sketches of mesh and Ring Topology .

ANS**: (each sketch 1M)**

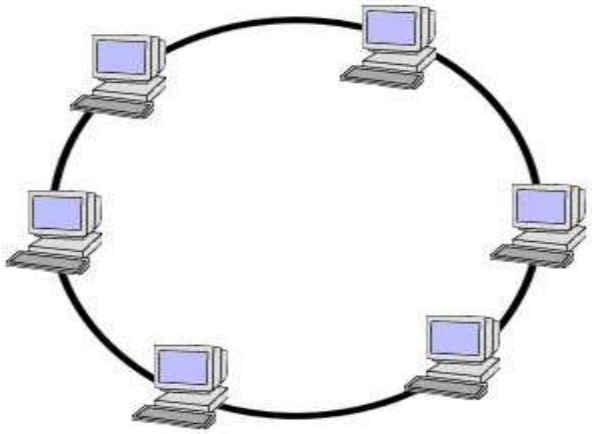


Fig. Ring Topology

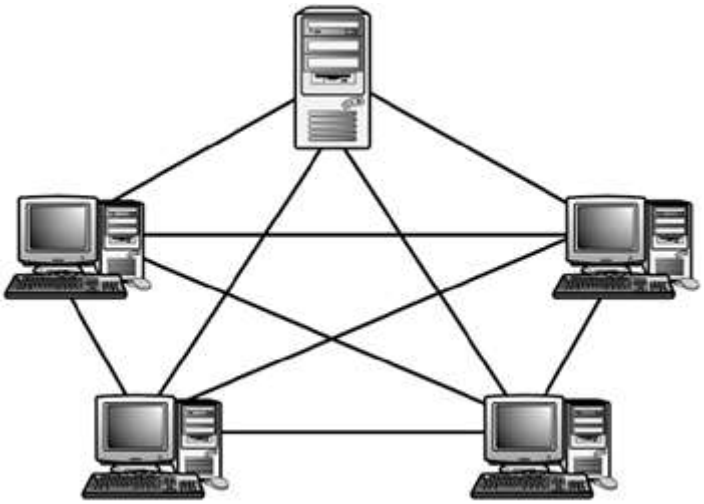
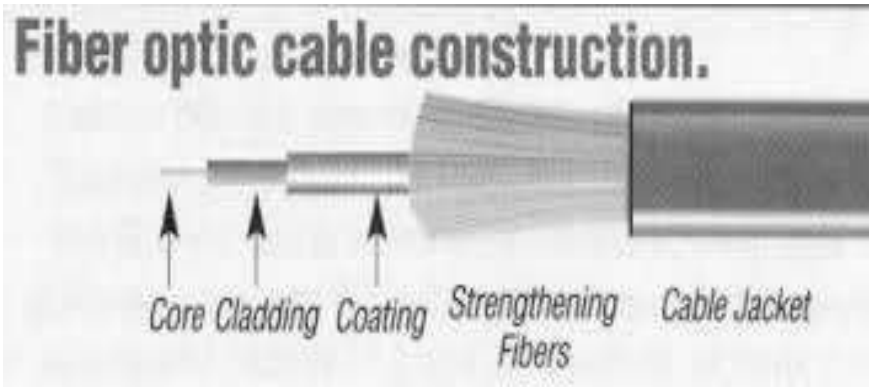


Fig.Mesh topology

f) Draw constructional diagram of fiber Optic Cable and label it properly.

ANS: **(Diagram 2M labeling 2 M)**



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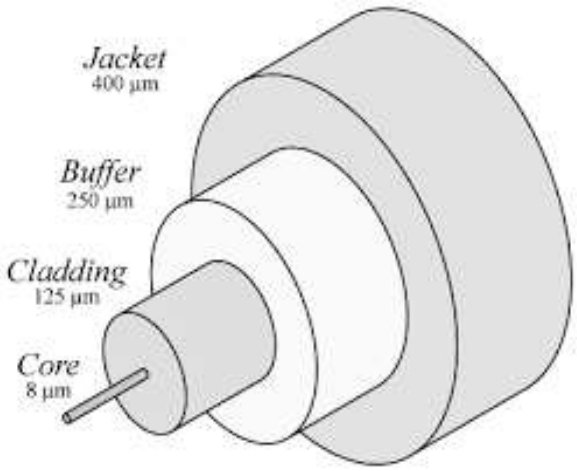


g) Define amplitude modulation and modulation index in AM.

ANS: **(Amplitude modulation 1M,modulation index 1M)**

NOTE: formula is not essential, or only formula should also be given relevant marks.)

Amplitude Modulation: Amplitude modulation is a technique of modulation in which the instantaneous amplitude of carrier signal is varied in accordance with amplitude of the modulating signal.

Modulation index: In AM wave the modulation index (m) is defined as the ratio of amplitude of modulating signal to carrier signal.

$$M.I = \frac{Modulating signal voltage (amplitude)}{Carrier signal voltage}$$

$$m = \frac{Em}{Ec}$$

$$= \frac{Vmax - Vmin}{Vmax + Vmin}$$

h) What is multiplexing? State its Type .

ANS: **[1mark meaning,1mark for Type}**

In multiplexing different channel carry data simultaneously .Many signal of different source on same load
The combined data transverses medium simultaneously

Type of Multiplexing:

a) TDM: Time division Multiplexing
b) FDM: Frequency division Multiplexing
c) WDM: Wave division multiplexing

(B). Attempt any TWO: 08M

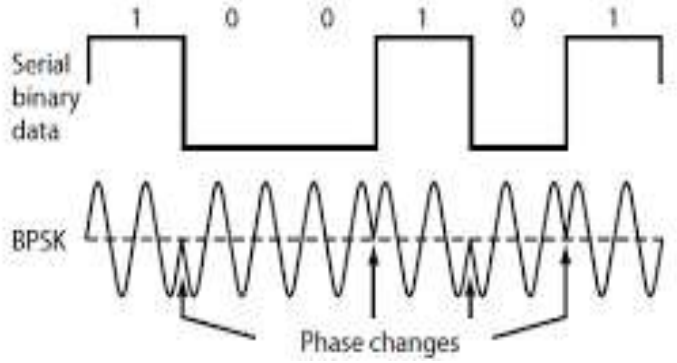
a) Define the BPSK and ASK with waveform.

ANS: (Defination 1M each, waveform 1M each)

BPSK: (Binary Phase shifting keying)

In phase shifting the phase of carrier is varied or shifted representing binary 1 & 0. Both amplitude and frequency remain constant.

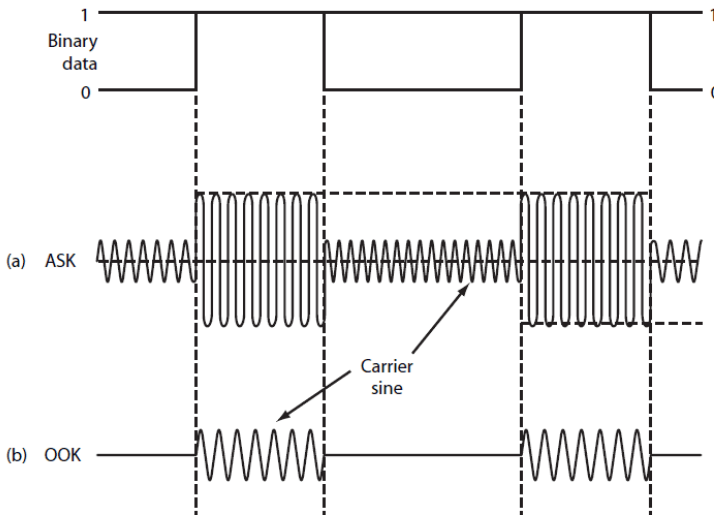
Waveform:



ASK: (Amplitude shift key)

In amplitude shift keying the amplitude of carrier is varied represent binary 1 and 0. Both frequency and phase remain constant.

Waveform:



b) Describe TDM with suitable block diagram.

ANS: (diagram 2 marks explanation 2 marks)

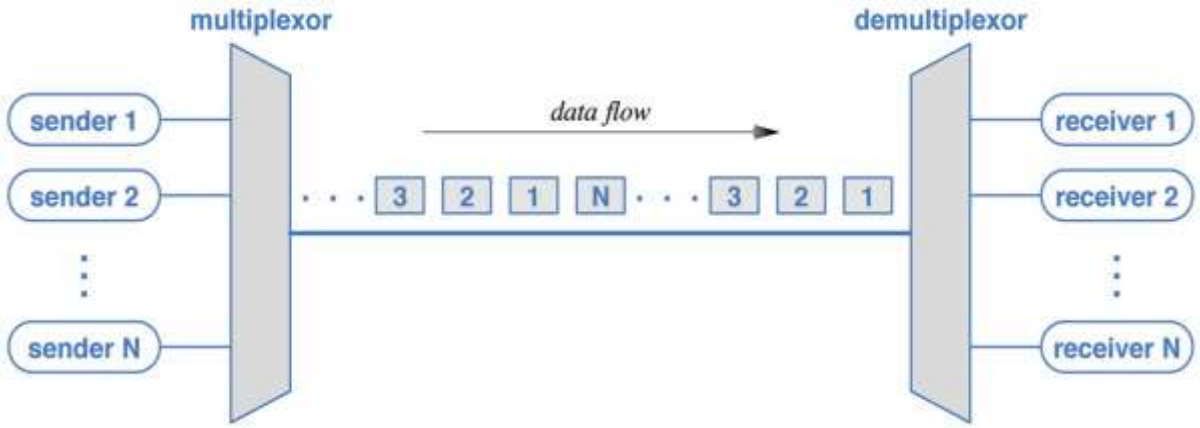


Fig. Block Diagram of TDM

Time-division multiplexing (TDM) :

- It is a method of transmitting and receiving independent signals over a common signal path by means of synchronized switches at each end of the transmission line so that each signal appears on the line only a fraction of time in an alternating pattern.
- The time domain is divided into several recurrent time slots of fixed length, one for each sub-channel. A sample byte or data block of sub-channel 1 is transmitted during time slot 1, sub-channel 2 during time slot 2, etc. One TDM frame consists of one time slot per sub-channel plus a synchronization channel and sometimes error correction channel before the synchronization.
- After the last sub-channel, error correction, and synchronization, the cycle starts all over again with a new frame, starting with the second sample, byte or data block from sub-channel.

c) Draw well labelled waveform of the following signals.

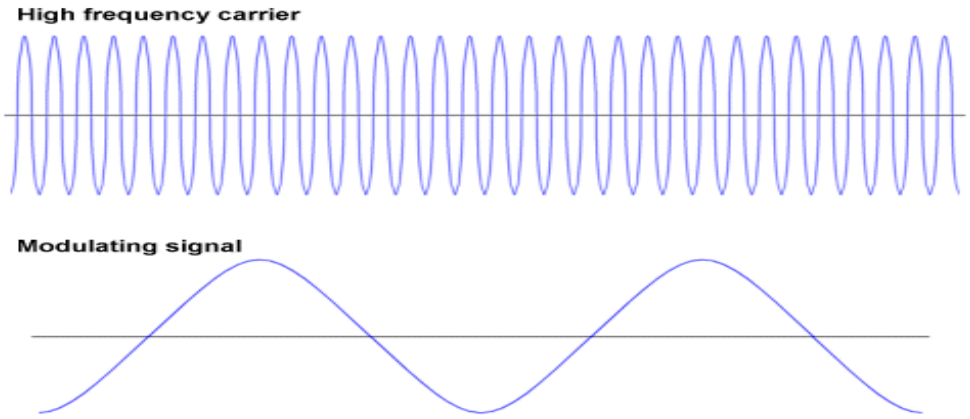
1) Modulating signal

2) Unmodulated carrier signal

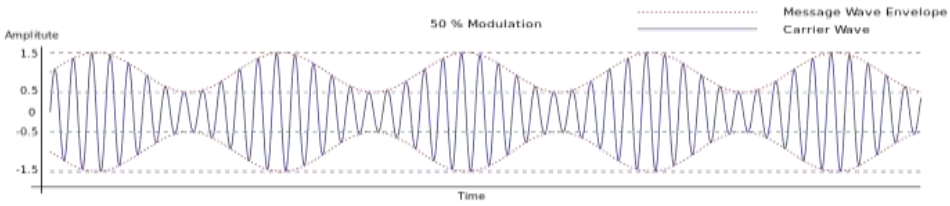
3) 50% modulated wave

4) 100% modulated AM wave

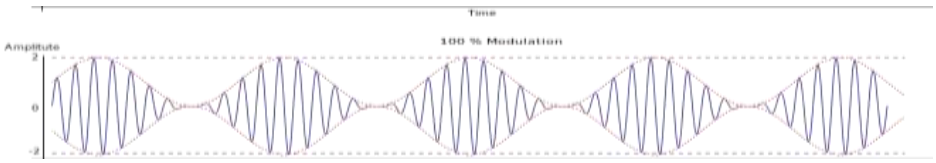
ANS: [1mark each wave form]



50% modulation



100% modulation



Q.2 ATTEMPT ANY FOUR: **16M**

a) Draw the block diagram of generation of PPM and its working

ANS: {2M Diagram,2M explanation} (any other relevant diagram and its explanation should be considered)

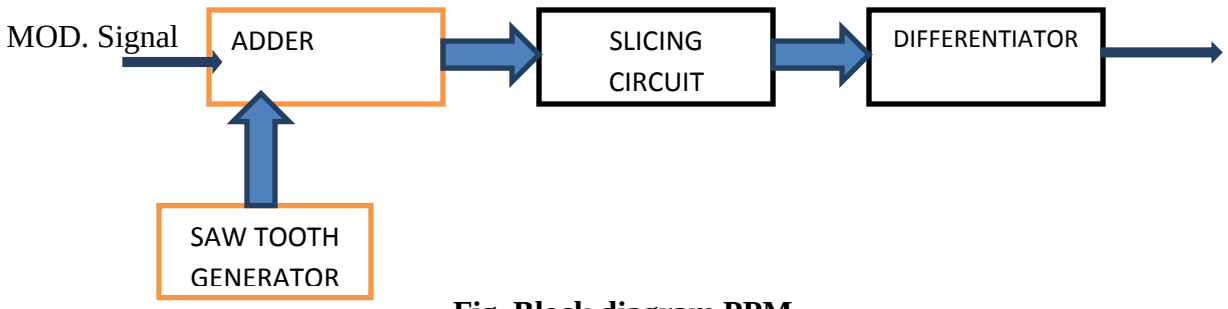


Fig. Block diagram PPM

Explanation:

a).**Modulating or input signal** which may be connected to adder circuit.

b) **Adder**: Modulating signal and sawtooth wave added together

c) **Slicing circui**t: This produce PWM.

d) D**ifferentiator**: Convert PWM to PPM

e) **Sawtooth Generator:** Create sawtooth waveform which with adder circuit create time delay waveform

b) What is Uplink and Downlink Frequency in satellite Communication? Explain with neat diagram.

ANS: (Downlink 2 marks, uplink 2 marks)

Downlink Frequency: In satellite telecommunication, a downlink is the link from a satellite down to one or more ground stations or receivers.

Uplink Frequency: An uplink is the link from a ground station up to a satellite.

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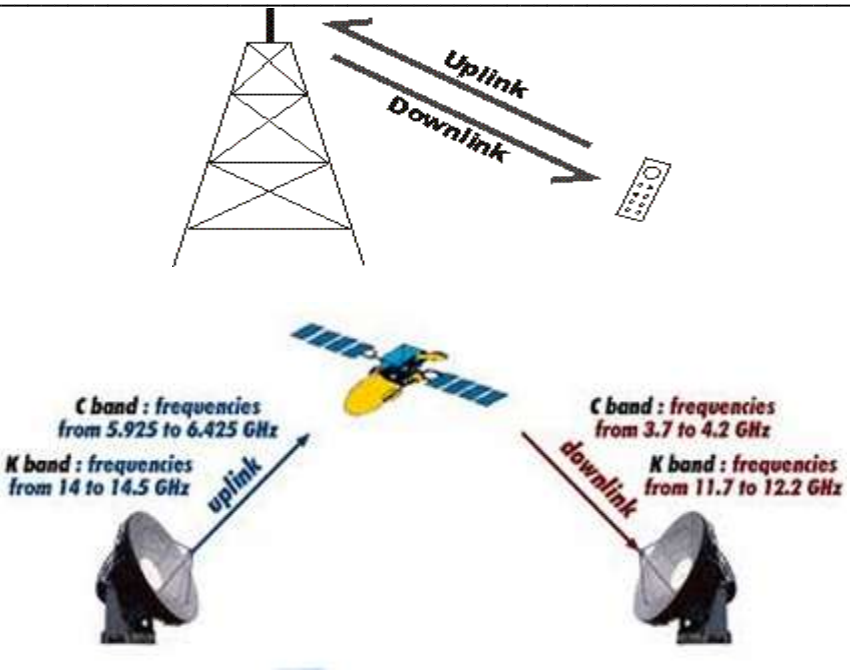
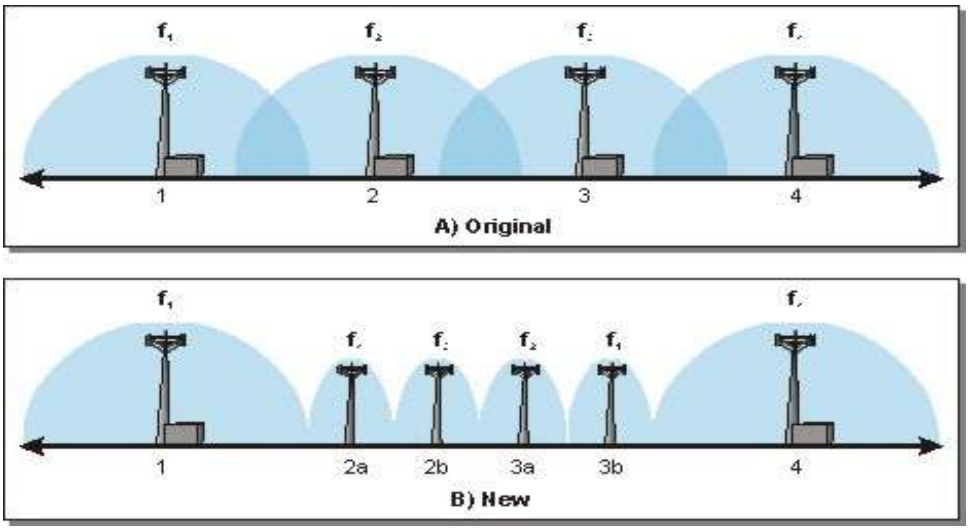


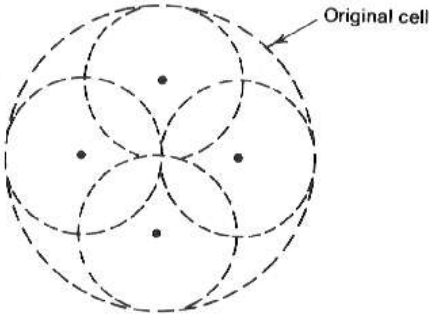
c) Explain the Concept of cell splitting.

ANS: [2 mark for dia., 2mark Exp.]

Cell Splitting:

Cell splitting is the process of dividing the radio coverage of a cell site in a wireless telephone system into two or more new cell sites. Cell splitting may be performed to provide additional capacity within the region of the original cell site.**[any other cell splitting dig should also be considered]**





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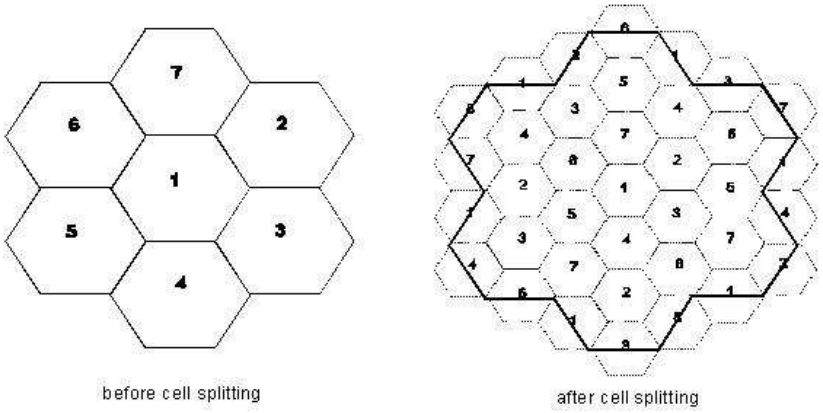
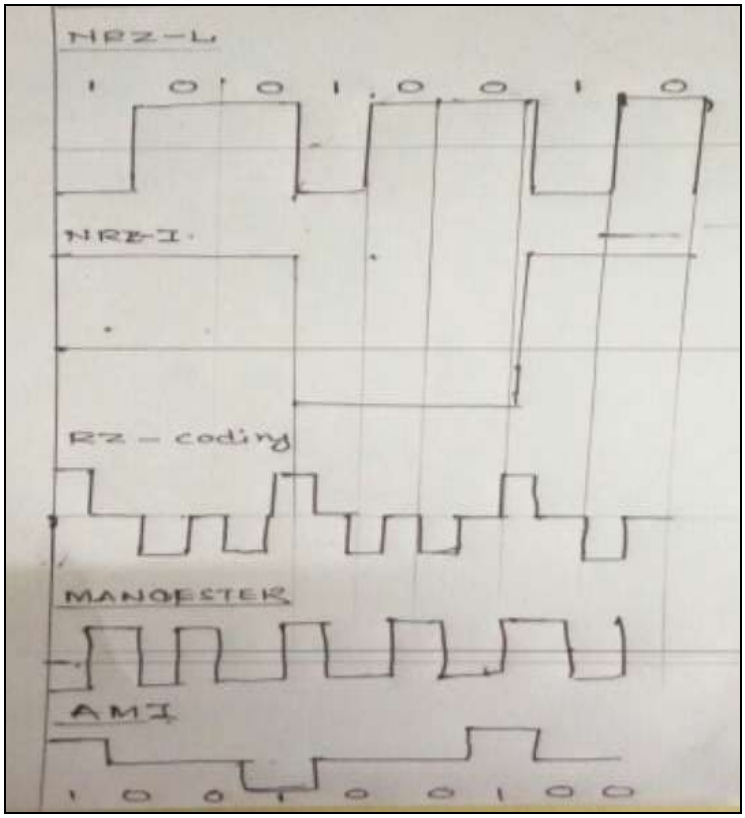


- This diagram shows the process of cell splitting that is used to expand the capacity (number of channels) of a mobile communication system.
- In this example, the radio coverage area of large cells sites are split by adjusting the power level and/or using reduced antenna height to cover a reduced area.
- Reducing the radio coverage area of a cell site by changing the RF boundaries of a cell site has the same effect as placing cells farther apart, and allows new cell sites to be added.

d) Encode the binary data 10010010 into return to zero/non return to zero (NRZ),NRZ,RZ,AMI, Manchester code

ANS: **[Each method 1 Mark]**

Binary data 10010010:



(e) Compare AM,FM and PM. On basis of following parameter.

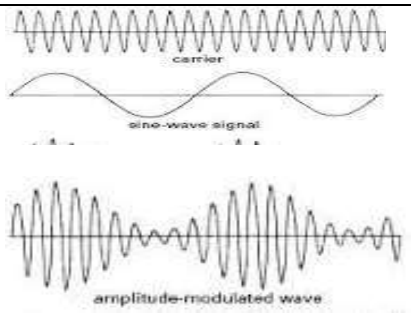
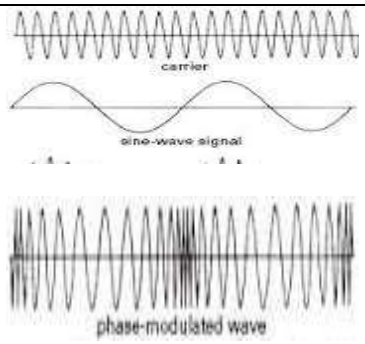
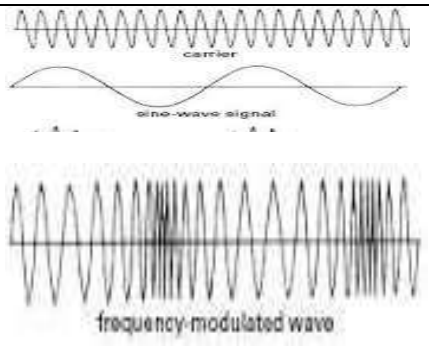
1) Bandwidth

2) Modulation Index

3) Waveform

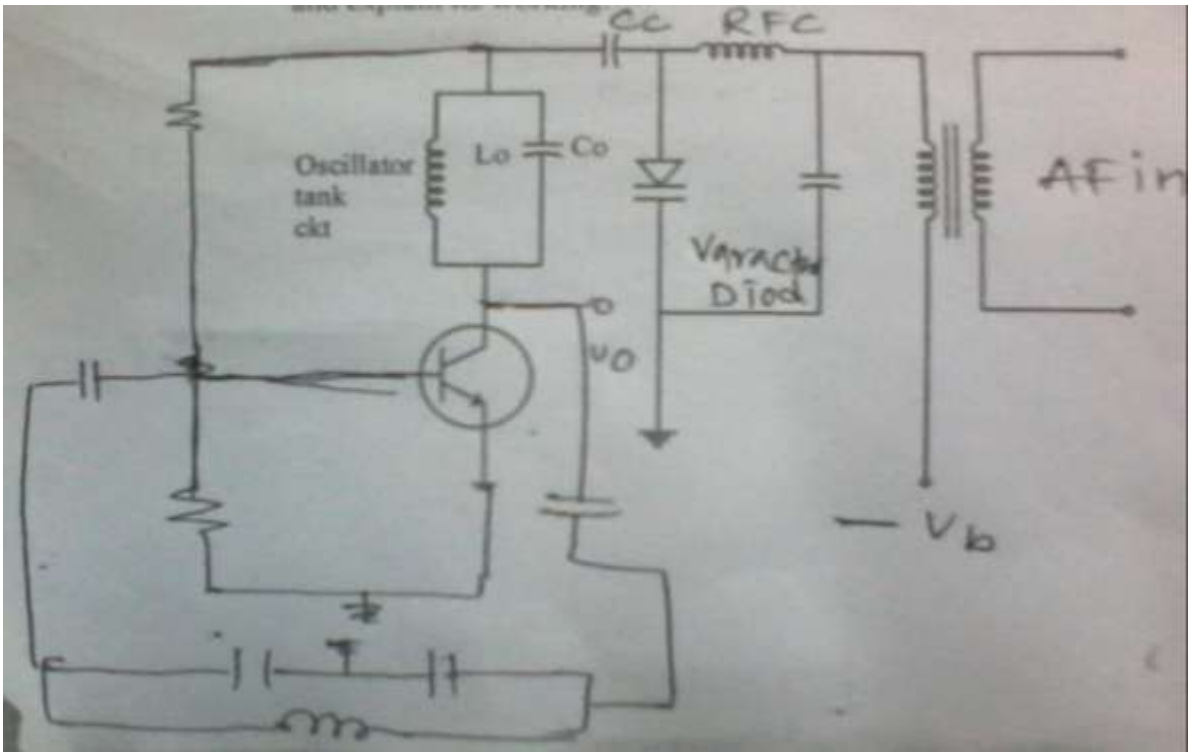
4) Noise immunity

ANS: (each point 1M)

Parameter	AM	FM	PM
BANWIDTH	2fm	$2(\delta + fm_{max})$	Same as FM
MODULATION INDEX	Em/Ec	δ / fm	$\theta_{max} = kp\ Em$
WAVEFORM			
Noise Immunity	less	high	High than AM less tha FM

f) Identify the circuit and redraw it with properly labelled components and explain its working.

ANS: (Block diagram 2M, explanation 2M)



Explanation:

Circuit is used to produce FM modulation. Varactor Diode together with a reactance modulator is used to provide Automatic Frequency Control for FM transmitter. It is seen that the diode has been back biased to provide junction capacitance effect and since this biased is varied by modulating voltage which is in series with it.

Q.3 Attempt any FOUR: **16M**

a) Draw block diagram of PCM transmitter. Write it's working.

ANS: **(Block diagram 2M, working 2M)**

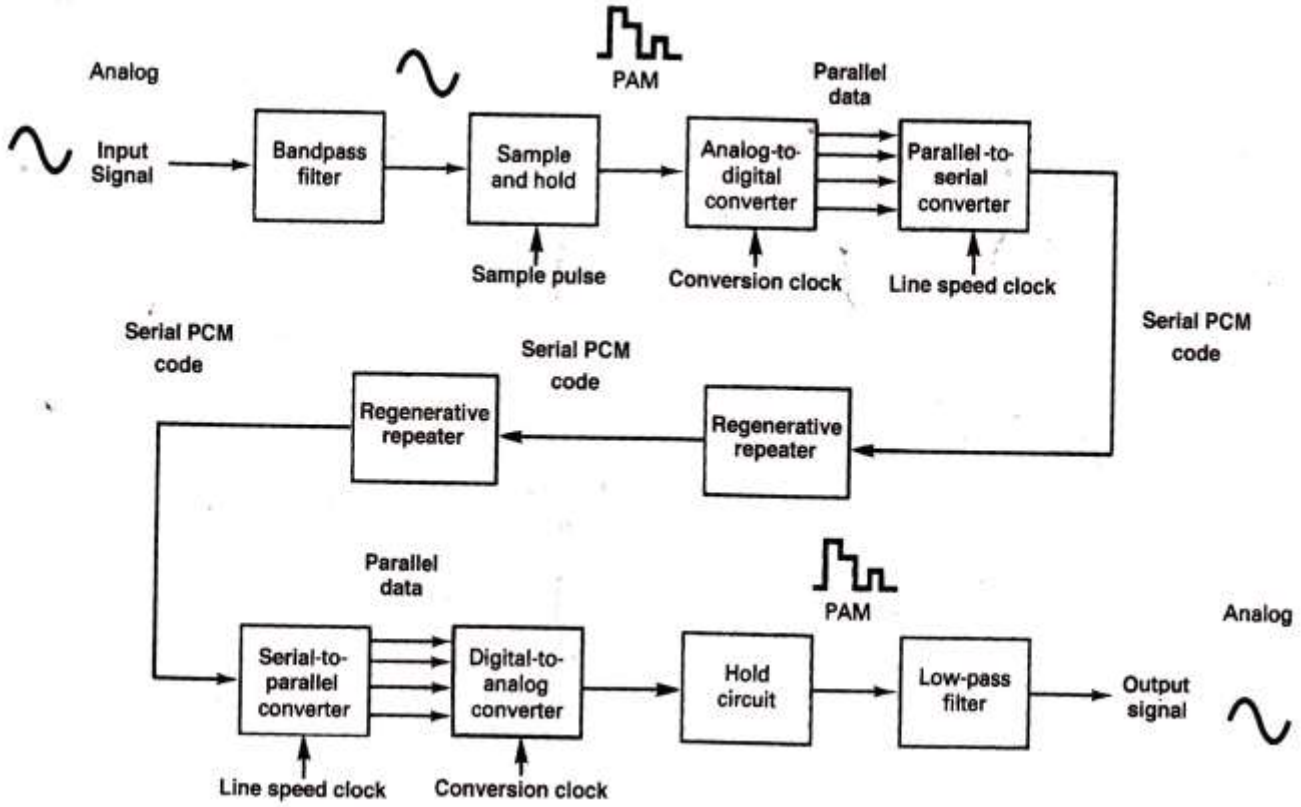


Fig. Block diagram of PCM transmitter

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:
    i. Natural sampling

ii. 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.

b) Define the term handoff. Give steps involved in handoff process and state its types.

ANS: **(Handoff-1M, steps -2M, types -1M)**

Handoff: Cellular system has the ability to transfer calls thar 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
- Execution
- Completion

Types of handoff are:[any other handoff can also be credited marks]

1. Soft handoff
2. Hard handoff

c) Write difference between PCM, Delta modulation, Adaptive delta modulation for four points.

ANS: **(Any four point four marks)**

Sr. No.	**Parameter**	**PCM**	**DM**	**ADM**
1.	Number of bits per sample	N can be 4, 8, 16, 32, 64 etc.	N= 1	N= 1
2.	Step size	Depends on the number of Q levels.	Step size is fixed	Step size is variable
3.	Distortions/ errors	Quantization error	Slope generated and granular noise	Granular noise

4.	Signaling rate and bandwidth	Highest	Low, if the input is slow varying	Lowest
5.	System complexity	Complex	Simple	Simple
6.	Feedback from output	No feedback	Feedback is present	Feedback is present
7.	Noise immunity	Very good	Very good	Very good
8.	Use of repeaters	Possible	Possible	Possible

d) Compare LED and Laser for two points.

ANS: **(each point 02M)**

Sr. No.	LED	LASER
1.	Small size	Bigger in size
2.	Non coherent light	Coherent light
3.	Require little power	Require more power than LED
4.	Bandwidth of LED is moderate	Bandwidth of LASER is high
5.	Generate photon by spontaneous emission	Generate photon by stimulated emission
6.	Response is fast	Response is faster than LED
7.	Intensity of generated light is less.	Intensity of generated light is large.

e) Draw block diagram of satellite communication system.

ANS: **(Block diagram 04M)**

Satellite system consists of three basic sections: transponder, uplink and downlink models:

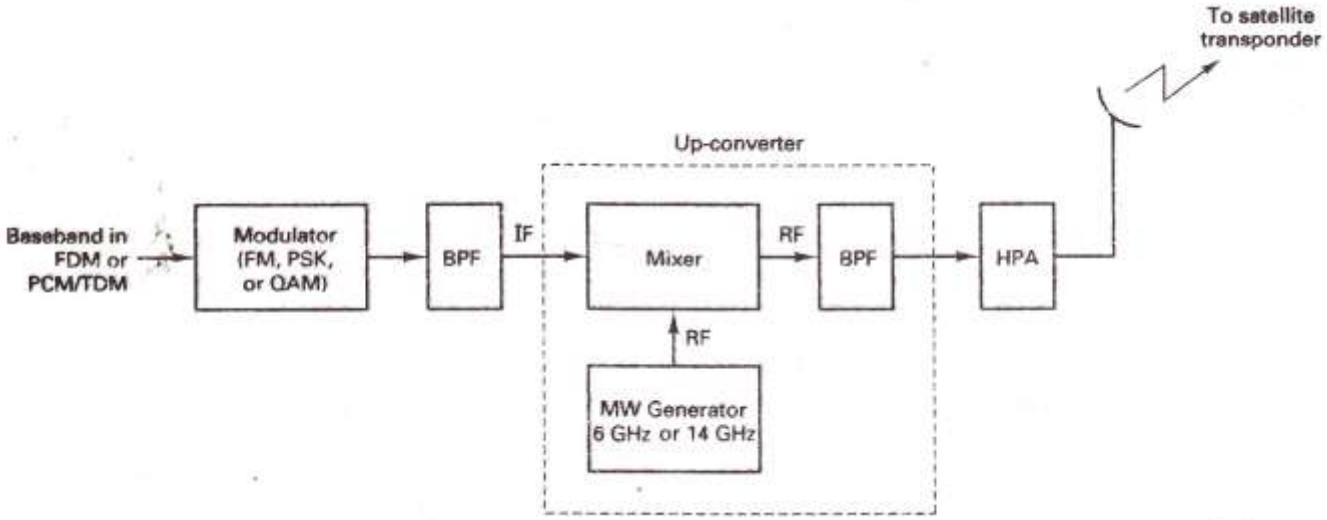


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Fig. Satellite uplink model

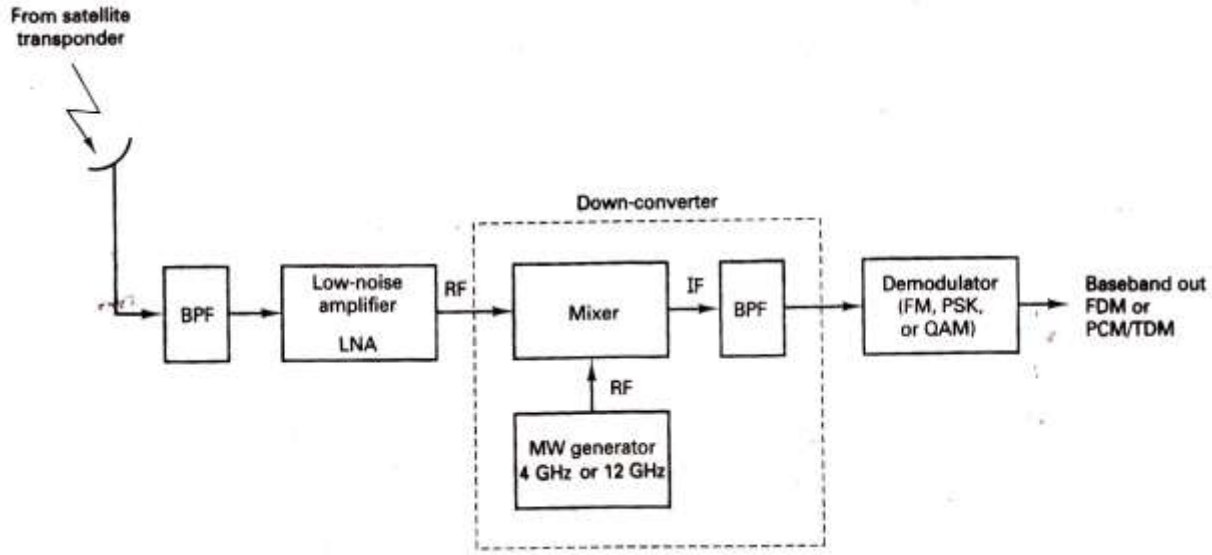


Fig. Satellite downlink model

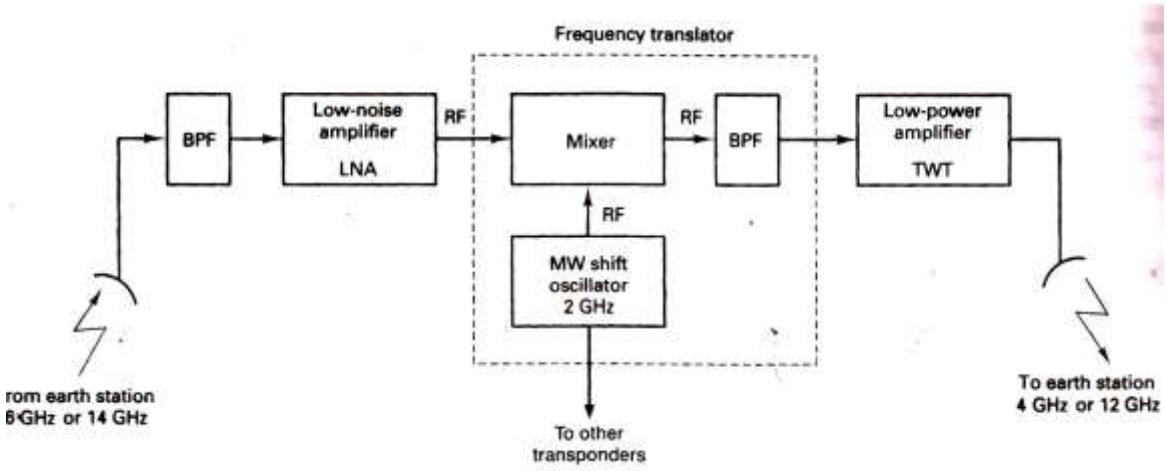


Fig. Satellite transponder

f) Describe the working of mobile communication with the help of block diagram.

ANS: (**working 02M, block diagram 02M)**

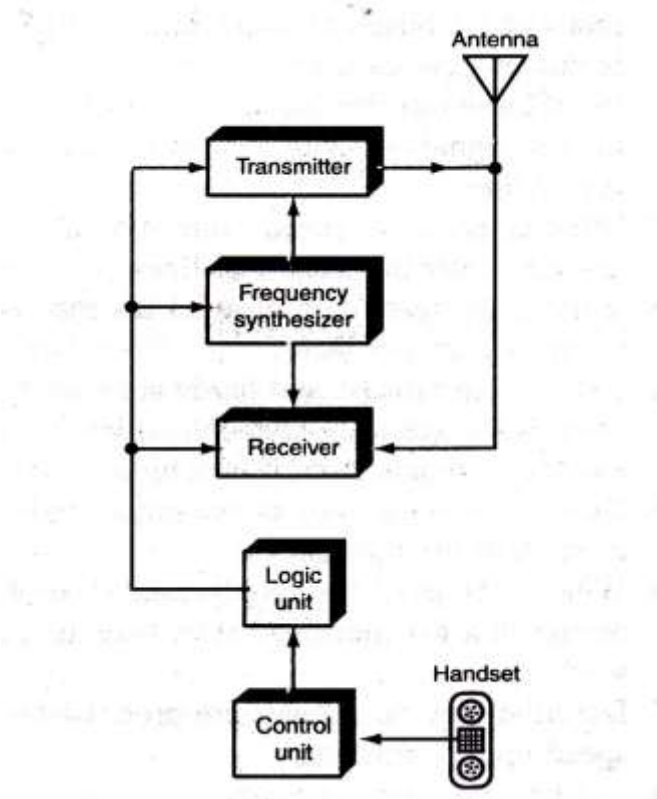


Fig. Block diagram of mobile communication

Explanation:

- The concept of cellular system in mobile communication is that rather than servicing a given geographical area with a single transmitter & receiver, the system divides the service area into many smaller areas known as cells. The receiver in each cell station continuously monitors the signal strength of the mobile unit.
- When the signal strength deeps below a desired level, it automatically seeks a cell where the signal from the mobile unit is stronger.
- Mobile unit consists of five major sections transmitter, receiver, synthesizer, logic unit, & control unit.
- It contain a built in rechargeable batteries.
- The transmitter & receiver share a single antenna.

-

Q.4 Attempt any FOUR: 16M

a) The carrier amplitude after AM varies between 4 volts and 1 volt. Calculate modulation of AM.

ANS**:**

Given: $V_{max} = 4V$

$V_{min} = 1V$

$$m = \frac{Vmax - Vmin}{Vmax + Vmin} \quad \text{.....2 mark}$$

$$= \frac{4-1}{4+1}$$

$$= \frac{3}{5} \quad \text{.....1 mark}$$

m= 0.6……..1 mark

b) Draw block diagram of Delta modulation and state function of each block.

ANS: (**diagram 2 marks function 2 marks)**

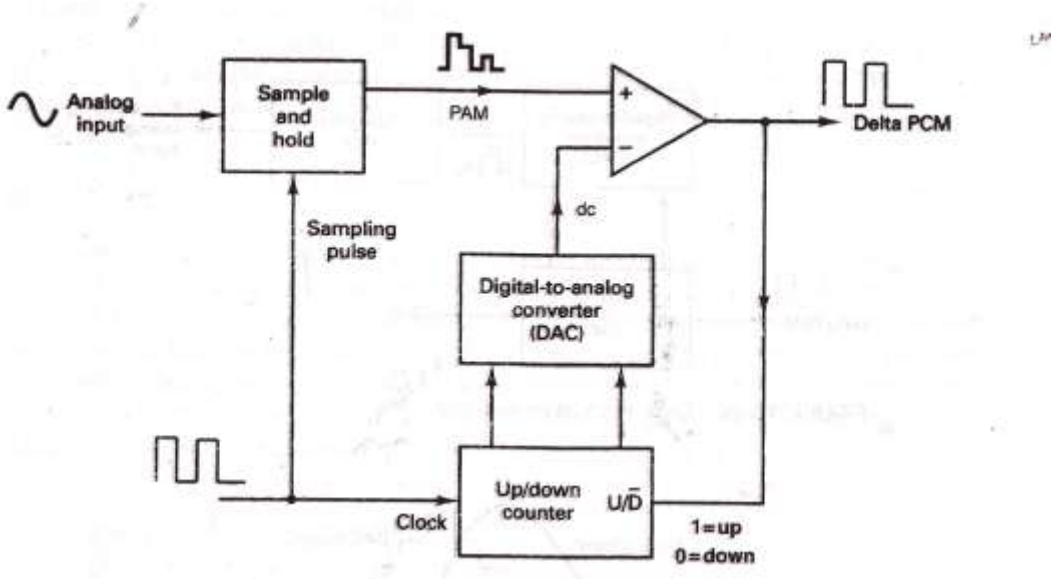


Fig. Delta modulation

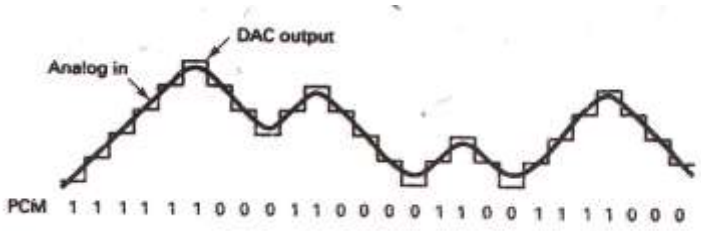


Fig. Operation of delta modulator

Functions:

1. **Sample and Hold circuit:**

   The input analog is sampled and converted to a PAM signal.

2. **DAC**:

   The output of 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.

3. **Up-Down counter**:

   The up-down counter is incremented or decremented depending on whether the previous sample is larger smaller than the current sample. The up-down counter is clocked at a rate to the sample rate. Therefore up-down counter is updated after each comparison.

c) Draw the block diagram of optical fiber communication system. Explain function of each block..

ANS: **(block diagram 02M, function 02M)**

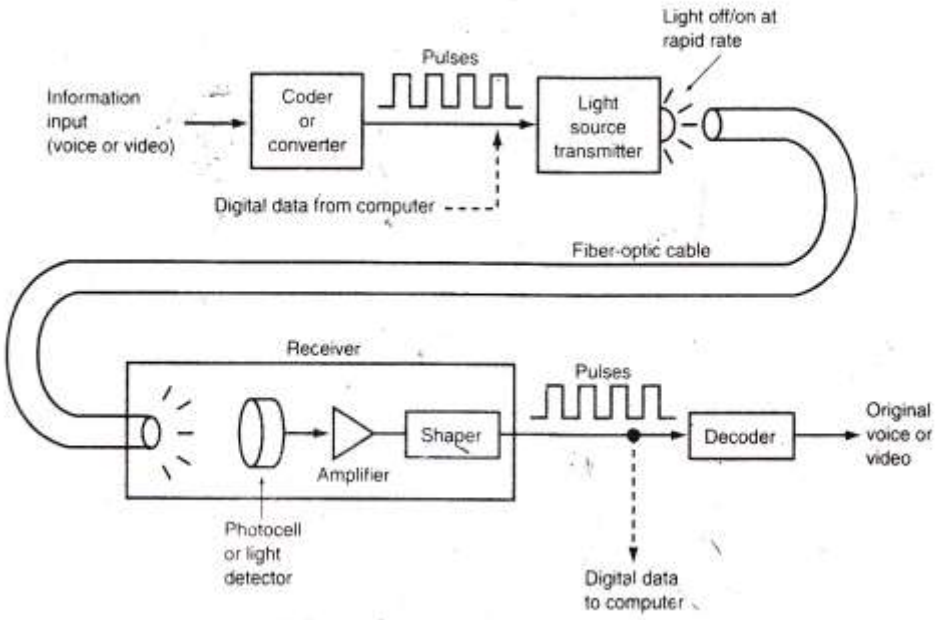


Fig. Optical fiber communication system

Explanation:

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.
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.

d) Give the different frequency bands used in satellite communication.

ANS: (**Different frequency bands 04M)**

Satellites are classified as:

- c band 4-6 GHz
- Ku band 12- 14 GHz
- Ka band 17-20 GHz
- S band 2-4 GHz

e) State the sequential steps for wire line (PSTN) to mobile (cellular) call procedure.

ANS: **(steps 04M)**

The sequential steps for wire line (PSTN) to mobile (cellular) call procedure are as follows:

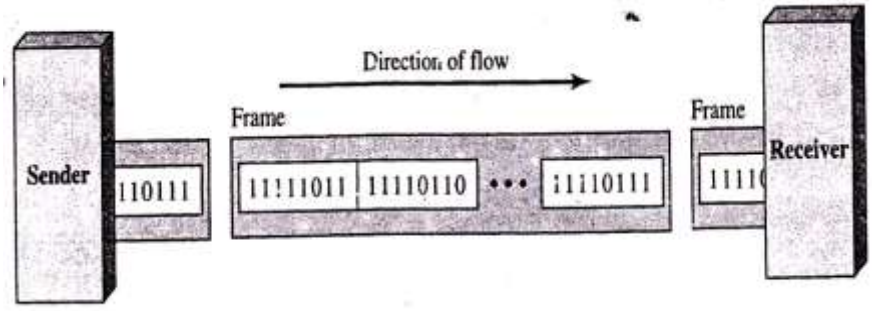
1. The wireline telephone goes off hook to complete the loop, receives a dial tone, and then inputs the mobile unit's telephone number.
2. The telephone number is transferred from the PSTN switch to the cellular network switch (MTSO).
3. The cellular network MTSO receives the incoming call from the PSTN, translates the received digits, and locates the base station nearest the mobile unit, which determines if the mobile unit is on or off hook(i.e. available).
4. If the mobile unit is available, a positive page response is sent over a reverse control channel to the cell-site controller, which is forwarded to the network switch (MTSO).
5. The cell-site controller assigns an idle user channel to the mobile unit and then instruct the mobile unit to tune the selected channel.
6. The mobile unit sends verification of channel tuning through the cell-site controller.
7. The cell-site controller sends an audible call progress tone to the subscriber's mobile telephone, causing it to ring. At the same time, a ring-back signal is send back to the wireline calling party.
8. The mobile answers (goes off hook), the switch terminates the call progress tones, and the conversation begins.

f) Define synchronous and asynchronous data transmission give one example of each.

ANS: **(each definition 2M)**

Synchronous data transmission:

The technique of transmitting each data word one after another without start and stop bits is refered as synchronous data transmission.

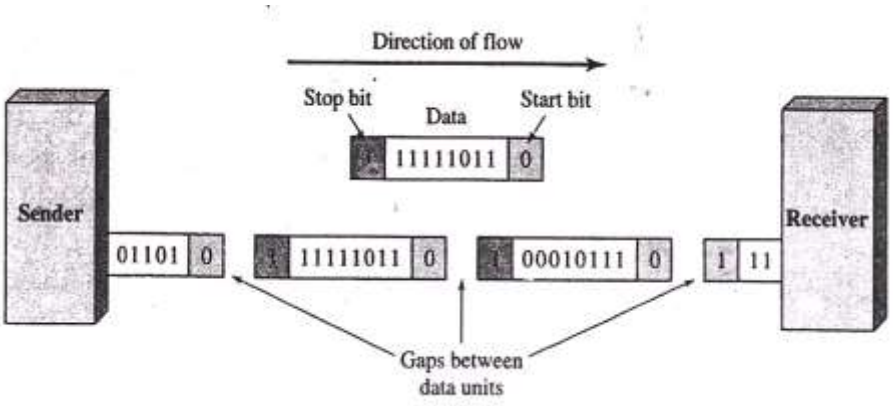


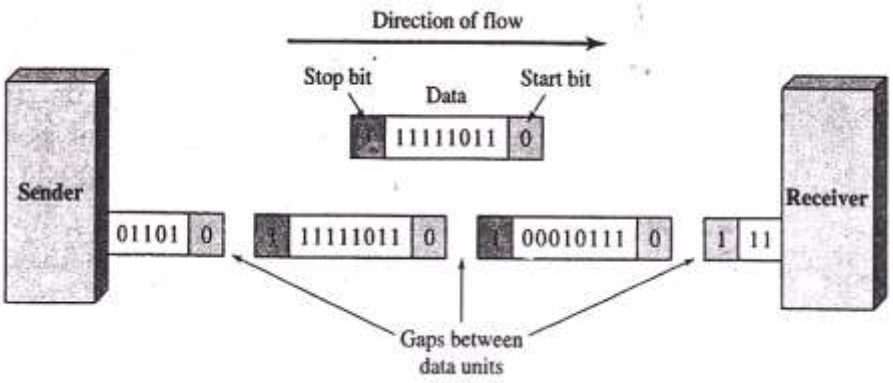
In synchronous transmission, the bit stream is combined into longer flames which may contain multiple bytes.

- 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 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.

Application:

The connection of keyboard to computer is a natural application of asynchronous transmission

Q5. Attempt any <u>FOUR.</u> **16M**

a) Draw the block diagram of BPSK generation. State function of each block.

ANS: (<u>DPSK Block Diagram2 mark ,2 mark Exp.)</u>

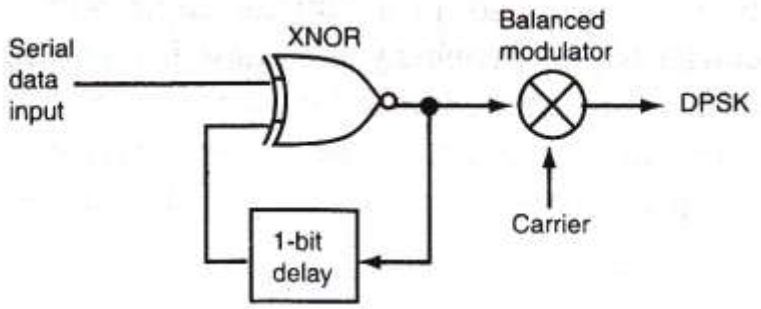
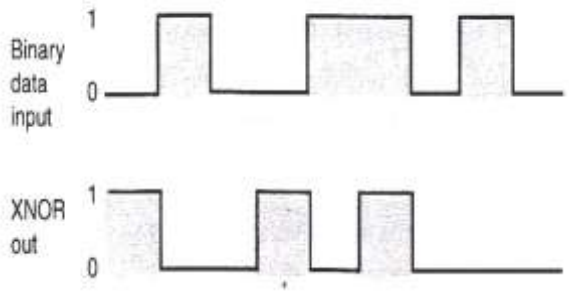


Fig. (a) Block doagram of DPSK

Explanation:

- In fig.(a) the output of the XNOR circuit is applied to a 1-bit delay circuit before being applied back to the input.
- The 1-bit delay may simply be a clocked flip-flop or a delay line.
- The resulting by comparing the present bit phase with the previously received bit phase.

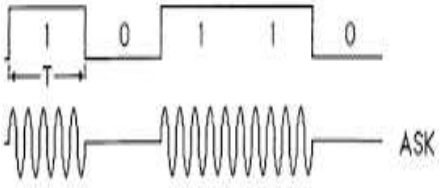
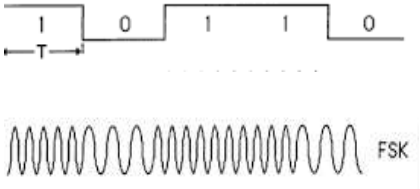
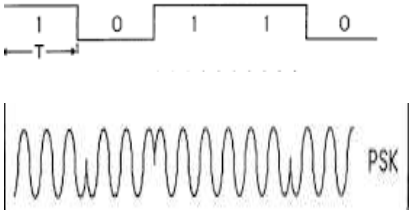
Wave Form:



- In this fig. (b) The input binary word to be transmitted is shown along with the output of XNOR circuit.
- An XNOR circuit is simply a 1-bit comparator that produces a binary 1 output when both inputs are alike and a binary 0 output when the two bits are different.
- The output of the circuit is delayed for a 1-bit internal by storing it in a flip-flop. Therfore, the XNOR inputs are the current bit plus the previous bit.
- The XNOR is then applied to the balanced modulator along with the carrier to produce a BPSK signal.

b) Compare ASK, FSK and PSK.

ANS: (1M each point)

PARAMETER	ASK	FSK	PSK
Bandwidth	(1+r)R R= bit rate,r=1	4fb fb=bit frequency	fb
Waveform			
Noise Immunity	less	More	More
Variable Parameter	Amplitude	Frequency	Phase

(c)Why uplink and downlink frequency are different in satellite communication? Give reason.

ANS: (any 2 reason-2M each)

- It's all about power considerations. In satellite communication, the signals have to cross the atmosphere which presents a great deal of attenuation. The higher the frequency, the more is the signal loss and more power is needed for reliable transmission.
- Lower frequencies get reflected by atmospheric bands and cannot penetrate to get through to the satellite.
- As satellite is a light-weight device which cannot support high-power transmitters on it. So, it transmits at a lower frequency (higher the frequency, higher is the transmitter power to accommodate losses) as compared to the stationary earth station which can afford to use very high-power transmitters. This is compensated by using highly sensitive receiver circuits on the earth station which is in the line-of-sight (LOS) of the satellite.

(d) Describe parallel data transmission with neat diagram.

ANS: **{2M Dia, 2M Explanation}**

Definition: Transmitting several bits of **data** simultaneously using multiple lines (8, 16, 32, and 64). The pathways between the CPU and memory are **parallel**, and they used to be **parallel** between the CPU and peripheral devices.

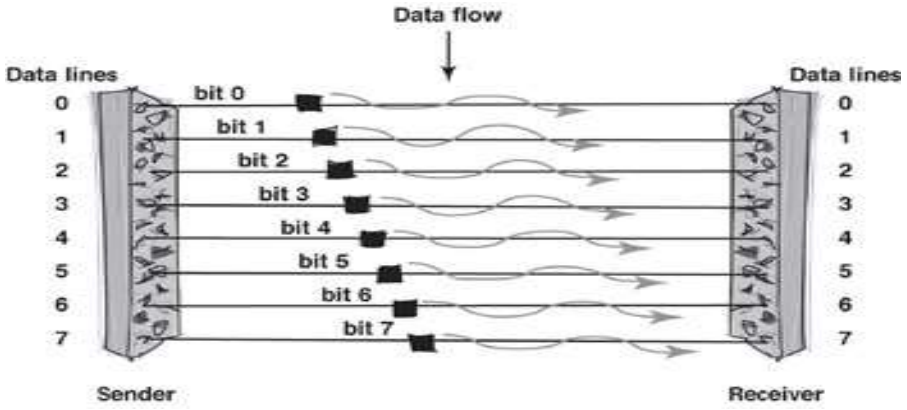


Fig. Parellel data transmission

Explanation:

- In parallel transmission, multiple **bits** (usually 8 bits or a byte/character) are sent simultaneously on different channels (wires, frequency channels) within the same cable, or radio path, and **synchronized** to a clock.
- Parallel devices have a wider data bus than serial devices and can therefore transfer data in words of one or more bytes at a time. As a result, there is a speedup in parallel transmission bit rate over serial transmission bit rate.
- However, this speedup is a tradeoff versus cost since multiple wires cost more than a single wire, and as a parallel cable gets longer, the synchronization timing between multiple channels becomes more sensitive to distance.
- The timing for parallel transmission is provided by a constant clocking signal sent over a separate wire within the parallel cable; thus parallel transmission is considered **synchronous**

(e) State uses of Hubs,repeater,bridges,and Router.

ANS: (1 mark each)

HUB:

A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so hat all segments of the LAN can see all packets.

ROUTER:

A device that connects any number of LANs. Routers use headers and a forwarding table to determine where packets go, and they use ICMP to communicate with each other and configure the best route between any two hosts. Very little filtering of data is done through routers. Routers do not care about the type of data they handle.

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

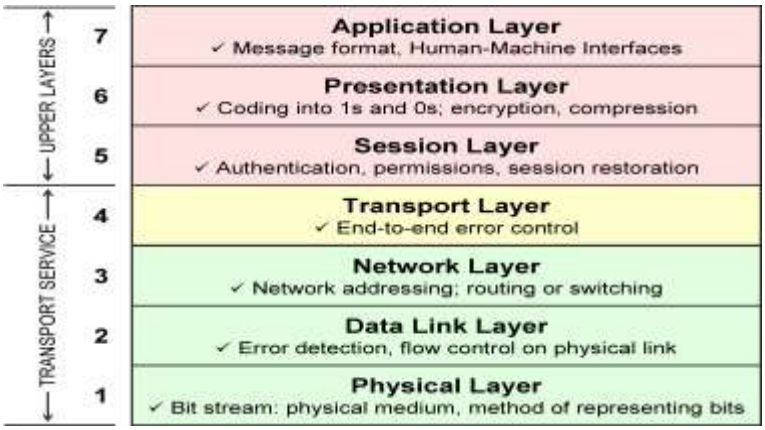
REPEATER:

A network device used to regenerate or replicate a signal. Repeaters are used in transmission systems to regenerate analog or digital signals distorted by transmission loss. Analog repeaters frequently can only amplify the signal while digital repeaters can reconstruct a signal to near its original quality. In a data network, a repeater can relay messages between sub networks that use different protocols or cable types. Hubs can operate as repeaters by relaying messages to all connected computers. A repeater cannot do the intelligent routing performed by bridges and routers

f) Draw architecture of OSI model and describe its all layers.

ANS: (diagram 2 marks only brief explanation should be considered 2 marks)

Fig. Seven layers of OSI



Layer 1 – Physical:

Physical layer defines the cable or physical medium itself, e.g., thinnet, thicknet, unshielded twisted pairs (UTP). All media are functionally equivalent. The main difference is in convenience and cost of installation and maintenance. Converters from one media to another operate at this level.

Layer 2 – Data Link:

- Data Link layer defines the format of data on the network. A network data frame, aka packet, includes checksum, source and destination address, and data. The largest packet that can be sent through a data link layer defines the Maximum Transmission Unit (MTU). The data link layer handles the physical and logical connections to the packet's destination, using a network interface. A host connected to an Ethernet would have an Ethernet interface to handle connections to the outside world, and a loopback interface to send packets to itself.

- Ethernet addresses a host using a unique, 48-bit address called its Ethernet address or Media Access Control (MAC) address. MAC addresses are usually represented as six colon-separated pairs of hex digits, e.g., 8:0:20:11:ac:85. This number is unique and is associated with a particular Ethernet device. Hosts with multiple network interfaces should use the same MAC address on each. The data link layer's protocol-specific header specifies the MAC address of the packet's source and destination. When a packet is sent to all hosts (broadcast), a special MAC address (ff:ff:ff:ff:ff:ff) is used.

Layer 3 – Network:

- NFS uses Internetwork Protocol (IP) as its network layer interface. IP is responsible for routing, directing datagrams from one network to another. The network layer may have to break large datagrams, larger than MTU, into smaller packets and host receiving the packet will have to reassemble the fragmented datagram. The Internetwork Protocol identifies each host with a 32-bit IP address. IP addresses are written as four dot-separated decimal numbers between 0 and 255, e.g., 129.79.16.40.

- The leading 1-3 bytes of the IP identify the network and the remaining bytes identifies the host on that network. The network portion of the IP is assigned by InterNIC Registration Services, under the contract to the National Science Foundation, and the host portion of the IP is assigned by the local network administrators. For large sites, the first two bytes represents the network portion of the IP, and the third and fourth bytes identify the subnet and host respectively.

- Even though IP packets are addressed using IP addresses, hardware addresses must be used to actually transport data from one host to another. The Address Resolution Protocol (ARP) is used to map the IP address to it hardware address.

Layer 4 – Transport:

- Transport layer subdivides user-buffer into network-buffer sized datagrams and enforces desired transmission control. Two transport protocols, Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), sits at the transport layer. Reliability and speed are the primary difference between these two protocols. TCP establishes connections between two hosts on the network through 'sockets' which are determined by the IP address and port number.

- TCP keeps track of the packet delivery order and the packets that must be resent. Maintaining this information for each connection makes TCP a stateful protocol. UDP on the other hand provides a low overhead transmission service, but with less error checking. NFS is built on top of UDP because of its speed and statelessness. Statelessness simplifies the crash recovery.

Layer 5 – Session:

The session protocol defines the format of the data sent over the connections. The NFS uses the Remote Procedure Call (RPC) for its session protocol. RPC may be built on either TCP or UDP. Login sessions use TCP whereas NFS and broadcast use UDP.

Layer 6 – Presentation:

External Data Representation (XDR) sits at the presentation level. It converts local representation of data to its canonical form and vice versa. The canonical uses a standard byte ordering and structure packing convention, independent of the host.

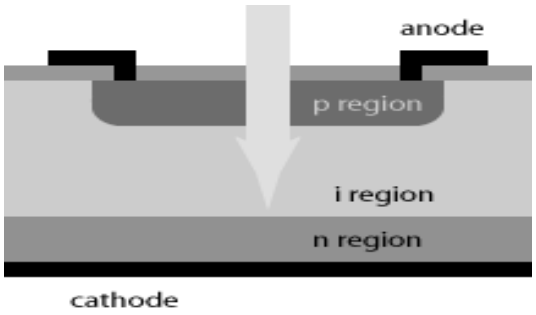
Layer 7 – Application

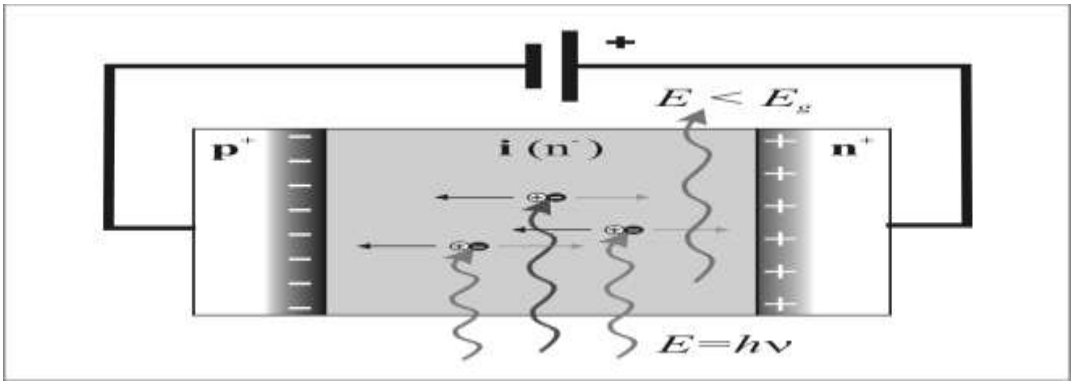
Provides network services to the end-users. Mail, ftp, telnet, DNS, NIS, NFS are examples of network applications.

Q.6 Attempt any FOUR: **16M**

a) Draw the diagram of PIN photodiode. Write its working principle.

ANS: (Diagram 2M, explanation 2M)





Explanation:

- The photodiode is operated under a moderate reverse bias. This keeps the depletion layer free of any carriers and normally no current will flow. However when a light photon enters the intrinsic region it can strike an atom in the crystal lattice and dislodge an electron. In this way a hole-electron pair is generated.
- The hole and electron will then migrate in opposite directions under the action of the electric field across the intrinsic region and a small current can be seen to flow. It is found that the size of the current is proportional to the amount of light entering the intrinsic region. The more light, the greater the numbers of hole electron pairs that are generated and the greater the current flowing.
- Operating diodes under reverse bias increases the sensitivity as it widens the depletion layer where the photo action occurs. In this way increasing the reverse bias has the effect of increasing the active area of the photodiode and strengthens what may be termed as the photocurrent.
- It is also possible to operate photodiodes under zero bias conditions in what is termed as a photovoltaic mode. In zero bias, light falling on the diode causes a current across the device, leading to forward bias which in turn induces "dark current" in the opposite direction to the photocurrent. This is called the photovoltaic effect, and is the basis for solar cells. It is therefore possible to construct a solar cell using a large number of individual photodiodes. Also when photodiodes are used in a solar cell, the diodes are made larger so that there is a larger

active area, and they are able to handle higher currents. For those used for data applications, speed is normally very important and the diode junctions are smaller to reduce the effects of capacitance.

- When not exposed to light the photo diode follows a normal V-I characteristic expected of a diode. In the reverse direction virtually no current flows, but in the forward direction it steadily increases, especially after the knee or turn on voltage is reached. This is modified in the presence of light. When used as a photo-diode it can be seen that the greatest effect is seen in the reverse direction. Here the largest changes are noticed, and the normal forward current does not mask the effects due to the light.

b) Explain different losses in fiber optic communication.

ANS: Losses in optical Fiber [1 mark for list 1.5 mark for explanation of any 2 losses]

Fiber-to-fiber connection loss is affected by intrinsic and extrinsic coupling losses. **Intrinsic coupling losses** are caused by inherent fiber characteristics. **Extrinsic coupling losses** are caused by jointing techniques. Fiber-to-fiber connection loss is increased by the following sources of intrinsic and extrinsic coupling loss:

1. Reflection losses
2. Fiber separation
3. Lateral misalignment
4. Angular misalignment
5. Core and cladding diameter mismatch
6. Numerical aperture (NA) mismatch
7. Refractive index profile difference
8. Poor fiber end preparation

REFLECTION LOSSES:

When optical fibers are connected, optical power may be reflected back into the source fiber. Light that is reflected back into the source fiber is lost. This reflection loss, called Fresnel reflection, occurs at every fiber interface. **Fresnel reflection** is caused by a step change in the refractive index that

FIBER ALIGNMENT:

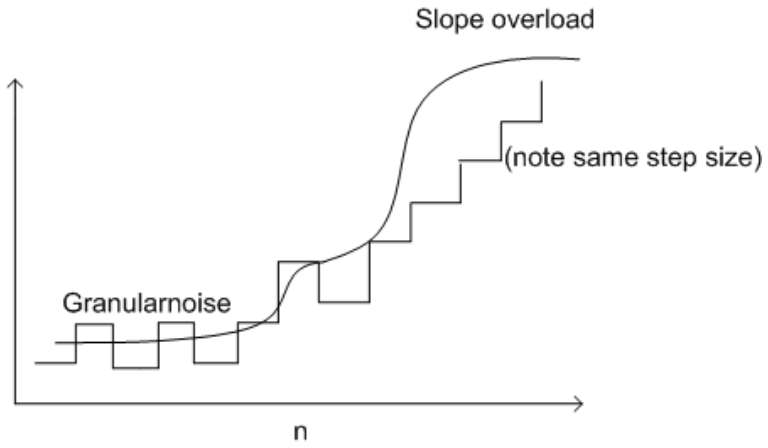
A main source of extrinsic coupling loss in fiber-to-fiber connections is poor fiber alignment. The three basic coupling errors that occur during fiber alignment are fiber separation (longitudinal misalignment), lateral misalignment, and

angular misalignment. Most alignment errors are the result of mechanical imperfections introduced by fiber jointing techniques. However, alignment errors do result from installers not following proper connection procedures.

c) Which error is occurred in Delta Modulation? How to reduce this error in any other system? Explain.

ANS: (2 marks for error and 2 marks for reason)

Error in Delta Modulation:



Slope Overload distortion and granular noise present

This error can be reduced using Adaptive delta modulation

UsingAdaptive delta modulation or continuously variable slope delta modulation (CVSD) is a modification of DM in which the step size is not fixed. Rather, when several consecutive bits have the same direction value, the encoder and decoder assume that slope overload is occurring, and the step size becomes progressively larger.

Otherwise, the step size becomes gradually smaller over time. ADM reduces slope error, at the expense of increasing quantizing error. This error can be reduced by using a low pass filter. ADM provides robust performance in the presence of bit errors meaning error detection and correction are not typically used in an ADM radio design, this allows for a reduction in host processor workload (allowing a low-cost processor to be used)

d) Differentiate between FDMA, TDMA, CDMA on the basis of following parameter:

1. Multiplexing Techniques

2. Power efficiency

3. Synchronization

4. Guard band

ANS: (1 mark each)

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

e) Describe message confidentiality and entity authentication in network security.

ANS: (2 mark each)

Message Confidentiality OR Privacy:

- It means that the sender and receiver expect confidentiality
- The transmitted message must make sense only to required receiver.
- For others message must appear as garbage.
- To achieve message confidentiality message must be encrypted at sender side and decrypted at receiver side which can be done by using cryptography.

Entity Authentication OR User identification:

- It is a technique to prove the identity of the party prior to access to system resources.
- An entity can be person, client, server or a process.
- Entity authentication happen in real time.
- Entity authentication authenticates the claimant for the entire duration of a session.

(NOTE: Marks should be awarded to Relevant explanation with respect to message confidentiality and entity authentication)

f) Write electrical characteristics of RS-232 standard.

ANS: (2 marks each)

RS232electrical Parameter:

RS-232 Voltage Specifications

	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

OR

RS232 voltage values		
Level	**Transmitter capable (V)**	**Receiver capable (V)**
Space state (0)	+5 ... +15	+3 ... +25
Mark state (1)	-5 ... -15	-3 ... -25
Undefined	-	-3 ... +3