MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

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Summer 2016   EXAMINATIONS

Subject Code: **17438**   <u>**Model Answer**</u>

<u>**Important Instructions to examiners:**</u>

1) The answers should be examined by key words and not as word-to-word as given in the 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 judgment 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 1. (A) Attempt any SIX : **12**

a) State the sources of noise (any four).

ANS: Noise: Noise is an unwanted electrical signal which gets added in transmitting signal while travelling.

Source to noise- (Note:-It should be **source of noise**)

1. Internal noise-This noise by any active or passive devices used in the electronic circuits-.
They are-a) short noise
   b) Thermal noise
   c) Johnson noise
External noise-
a)Natural -Sources are lighting, radiation from sun ,stars etc.
b) Man-made- occurs due to electrical ignition systems of automobiles, welding machines, motors etc.

b) **Define foot print and station keeping.**

ANS: (Each definition- 2 mks)
 Footprint:- It is coverage area on earth surface where satellite signals are available.

Station Keeping:- Due to many reasons satellite distract from its intended orbit To bring it back to its original orbit motors present on satellites are used by sending control signals from ground station this activity is called as station keeping.

c) **Define WAN & MAN.**
ANS: : (Each definition- 2 mks)

WAN (wide area Network):-It is network which covers large area like continent ,countries even entire world. The nodes of WAN are connected by large subnets Ex. Internet

MAN (metropolitan area network):- It is network which connects computers present in large area likewise within city .It connects computers present in different network which are separated by large distance .
Ex. Cable TV network within city

d) **Sate the difference between ASK & FSK (any four).**
ANS: (Any 4 points- 4 mks)

Sr. No.	Parameter	ASK	FSK
1	Variable parameter	Amplitude	Frequency
2	Noise immunity	Low	High
3	Bite Rate	Suitable up to 100bits/sec	Suitable up to 1200bits/sec
4	Application	Low speed modem	Medium speed modem

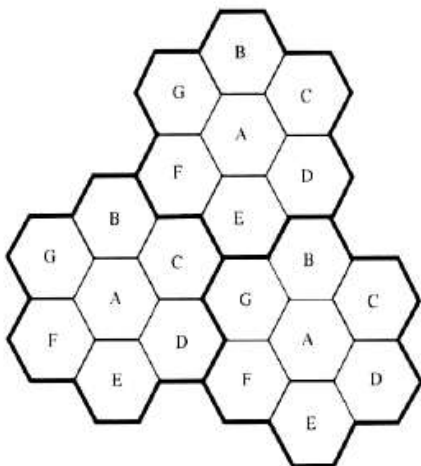**e) Draw a block diagram of satellite communication.**

ANS:- (Diagram – 4 mks)
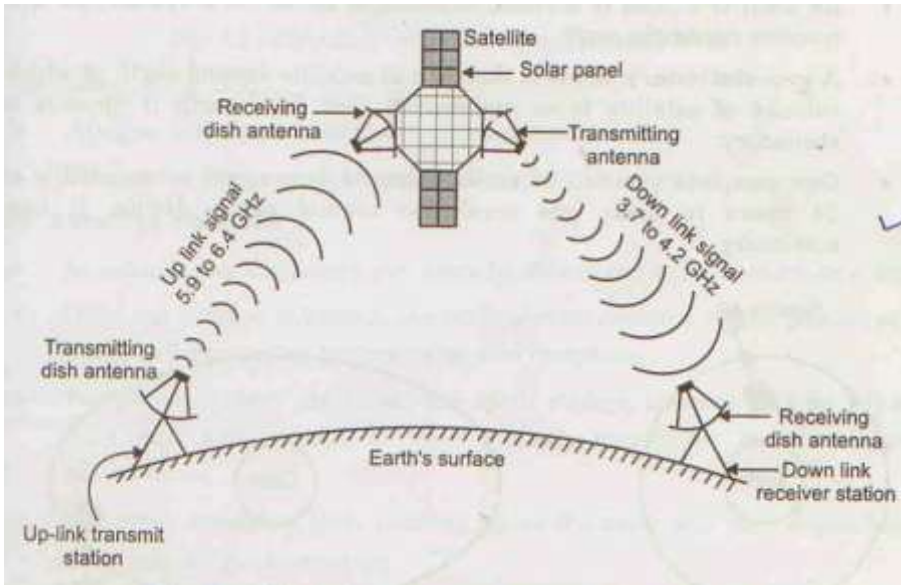

f)   State the concept of cell pattern.

ANS:- (Diagram- 2mks, concept- 2 mks)

Cell pattern- Defined as the geographical pattern when the electromagnetic radiation can be received without creation interference in neighboring region. For example the cell pattern is hexagonal shaped as shown below-

g) Draw waveform for the code 10110100 in ASK & FSK modulation.

ANS:- (2mks for each waveforms)
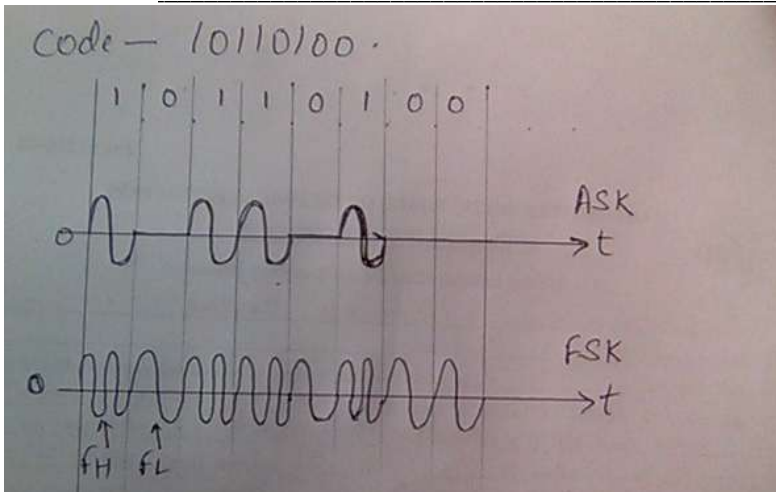
h) **State the advantages of Geostationary satellite (any two).**

**ANS:** Advantages:- (any 2 advantages- 1 mks each)

1. In synchronous orbit, satellite angular velocity is same as the earth and so it appears to be stationery.
2. It can cover the entire earth surface.
3. It is not necessary to rotate the dish antenna on earth and then track to satellite.
4. Continues communication is possible.

(B) Attempt any TWO of the following: 08

a) **State the working principle of BPSK generator with the help of block diagram. Draw suitable waveform.**

**ANS: -(block diagram- 2 mks, waveforms- 1 mks, principle – 1mks)**
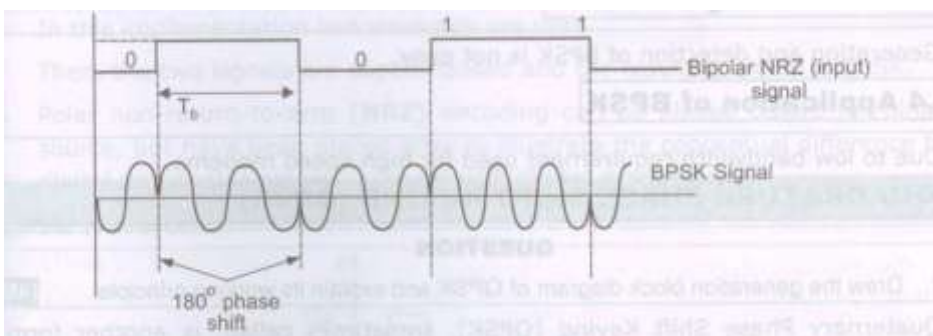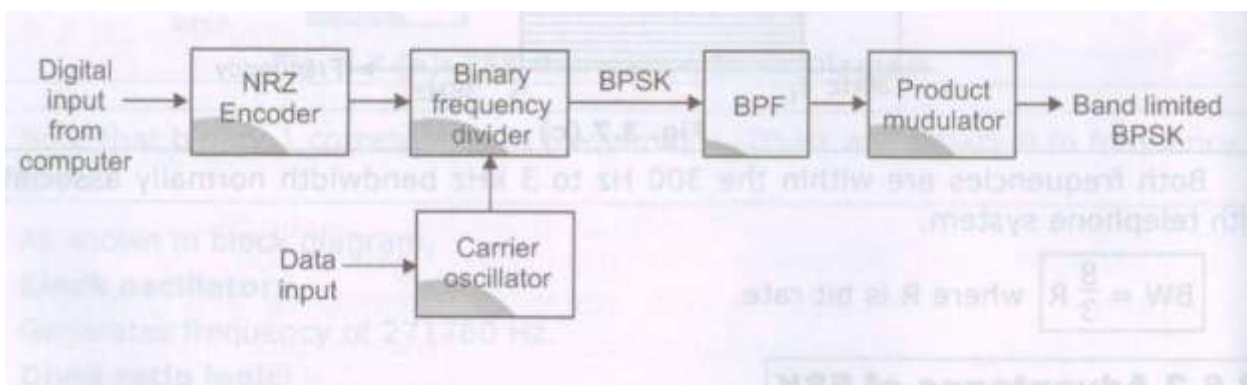
Working Principle: In PSK , as the input digital signal changes the state (i. e. from 1 to 0 or from 0 to 1), the phase of the output carrier shift between two angles that are separated by 1800.
Generation of PSK : Figure shown the generation block diagram of PSK. NRZ encoder: This converts binary data signal (0"s and 1"s) into NRZ bipolar signal. Carrier oscillator: Generates sine wave carrier signal. Product modulator: Multiplies input data and carrier which results BPSK signal. BPF: It is bandpass filter which limits the frequency band of BPSK. As shown in waveform, the carrier phase is changed between 00 and 1800 by the bipolar digital signal.

b) Draw the block diagram and explain the working of mobile communication.
ANS:- (block diagram- 2 mks, working – 2mks)
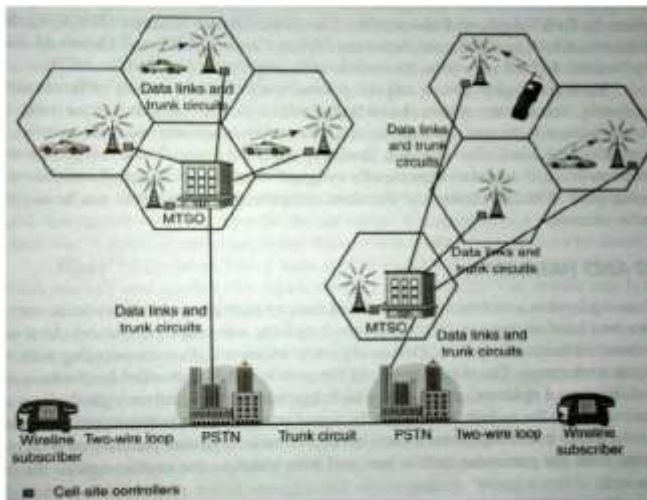
Explanation:-
Fig shows a mobile or cellular telephone system that includes all the basic components necessary for mobile communication.
The radio network is defined by a set of radio frequency transreceiver located within each of the cells. The location of these radio frequency transreceivers are called 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 radio-frequency 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.
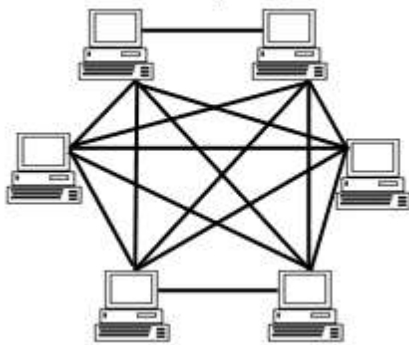OR
Note :-Student can interpret block diagram in different way but it should consist basic blocks marks should be given for that also.
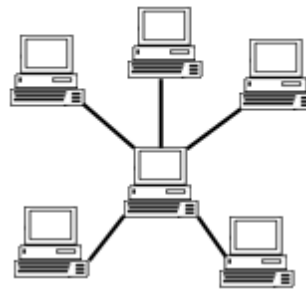
c) Draw suitable diagram of MESH, STAR, BUS & RING topology with advantages, disadvantages and application of each.
ANS: (pl note- the question is not suitable foe 4 mks, pl give mks if attempted proper and enough)
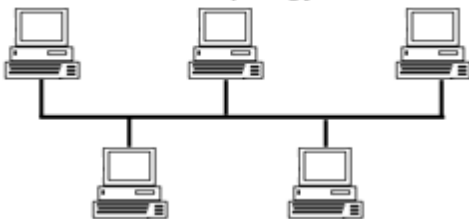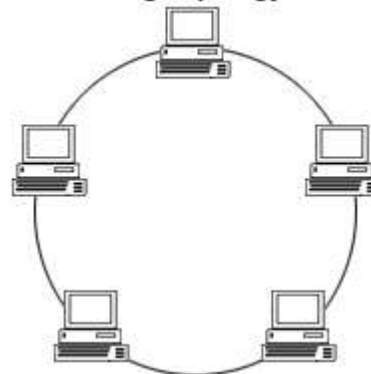
Bus topology:-
Advantages(1 point)

1 .easy to install

2. requires less cables comparing with Mesh topology

3. cost of installation is easy

4. any device can initiate data transmission

5. adding node within particular limit is easy

Disadvantage (1 point)

1. There is a limit on central cable length and number of nodes that can be connected.

2. It is difficult to detect and troubleshoot fault at individual station.

3. Maintenance costs can get higher with time.

4. Efficiency of Bus network reduces, as the number of devices connected to it increases.

Ring Topology:-

Advantages (1 point)
Every node send the data when it receives an empty token this reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

Even when the load on the network increases, its performance is better than that of Bus topology.

There is no need for network server to control the connectivity between workstations.

Additional components do not affect the performance of network.

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Each computer has equal access to resources.

Disadvantages (1 point)

Each packet of data must pass through all the computers between source and destination. This makes it slower than Star topology.

If one workstation or port goes down, the entire network gets affected.

Network is highly dependent on the wire which connects different components.

MAU's and network cards are expensive as compared to Ethernet cards and hubs.

## Q 2. Attempt any FOUR of the following: 16

a) State the difference between AM & FM.(4 points)
ANS:

Parameters	AM	FM
Sidebands	Two	Infinite
Bandwidth	2 Fm	2(δ+Fm)
Noise Immunity	Low	High
Transmission frequencies used	540 – 1650 KHz	88-110 MHz

b) State and explain sampling theorem.
ANS: Sampling theorem:- A continuous time signal x(t) can be completely represented in its sampled form at the transmitter and recovered back from its sampled form at receiver(with minimum distortion) if the sampling frequency fs≥2w.   (1 mks)
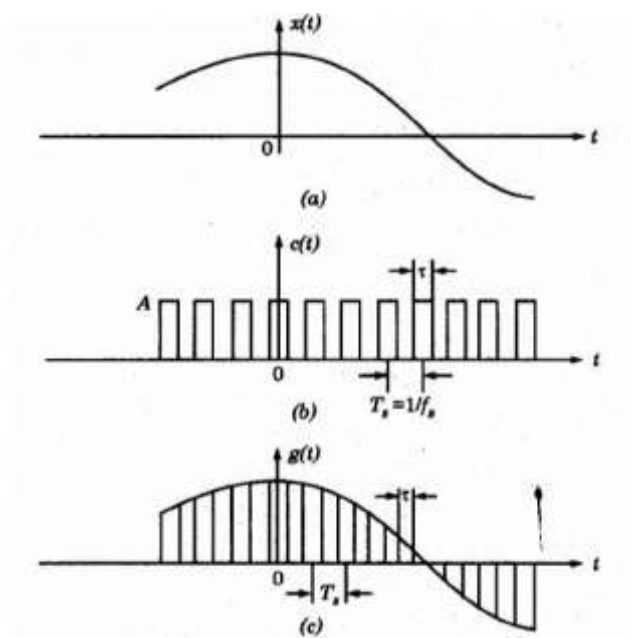
(1 mks)

Explanation -   **(2 marks)**
Figure above shows the block diagram of sampling process in which continuous time wave signal is applied to the input of multiplier and another input of multiplier is a digital train of pulse signal. When it is applied to the multiplier the output of multiplier is a sampled output signal. As the number of samples increases the period between two adjacent samples Ts will decreases and

sampling frequency fs will increase. So that for better representation of signal the sampling frequency should be as high as possible.

Ts= 1 / fs = Sampling Period.
Fs = 1/ ts = Sampling rate

c) Draw a block diagram of PCM and state two advantages of it.

ANS: (block diagram- 2 mks, any 2 advantages- 2 mks)
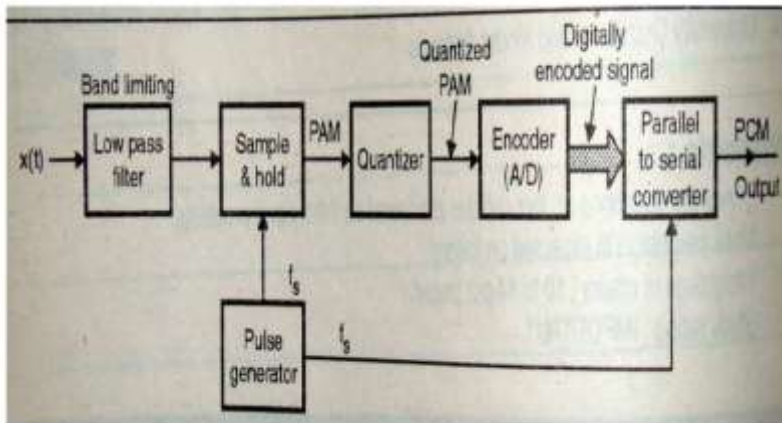
Advantages:

1) Regeneration without noise amplification is possible
2) Can withstand channel noise & distortion
3) Flexible hardware implementation is possible
4) As output is digital, hence storage is possible

d) State the need of data encoding technique. Classify it.

ANS:(Need- 2 mks, Classification- 2mks)

Digital to digital conversion or encoding is the representation of digital information by a digital signal.

For example, when we transmit data from our computer to printer, both the original data and transmitted data are digital. In this type of encoding the binary 1's and 0's generated by a computer are translated into sequence of voltage pulse that can be propagated over a wire.

Figure shows the relationship between, the digital information, the digital-to digital encoding hardware and the resultant digital signal.

Classification of encoding techniques:

There are three types of encoding techniques.

Digital-to-digital encoding techniques

Unipolor   Polor

Bipolar

RZ   NRZ   NRZ   RZ   Manchester   AMI   B8ZS

HDB3

NRZ-L   NRZ-I

Differential Manchester
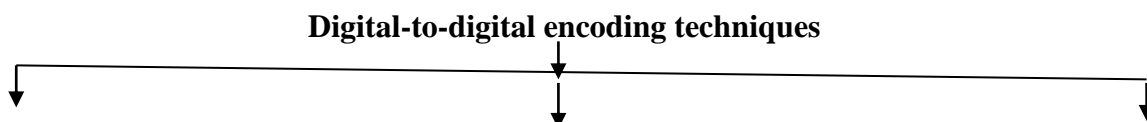
e) Give advantages of pulse modulation over amplitude modulation.
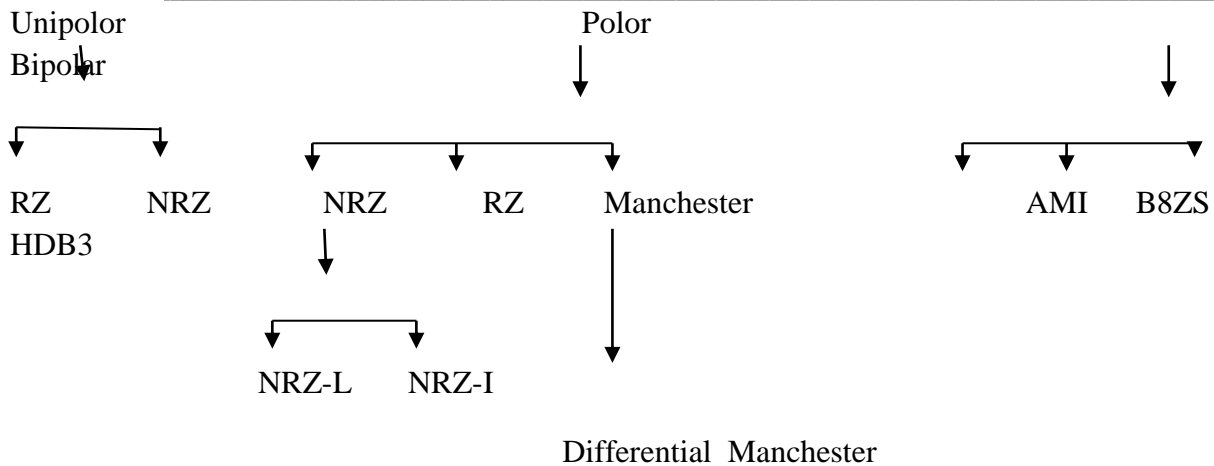
ANS: (Any 4 advantages- 1 mks each)

1. Comparing to continuous wave modulation, the performance of all pulse modulation schemes except PAM in presence of noise is very good.
2. Due to better noise performance, it requires less power to cover large area of communication
3. Due to better noise performance and requirement of less signal power, pulse modulation is most proffered for the communication between space ships and earth.
4. Efficiency is better.

f) If the carrier frequency is 50KHz &   with modulating voltage of 12 V, modulating frequency 3 KHz. Calculate the modulation index for FM. Also state total frequency deviation.

ANS: Given data- **(is insufficient)**

Fc= 50 KHz

Vm=12 V

Fm= 3 KHz

Find- m= modulation index   ?

Frequency deviation = δ

Modulation index = δ/ Fm

mf = δf /fm   (1 mks)

fm = δf/mf

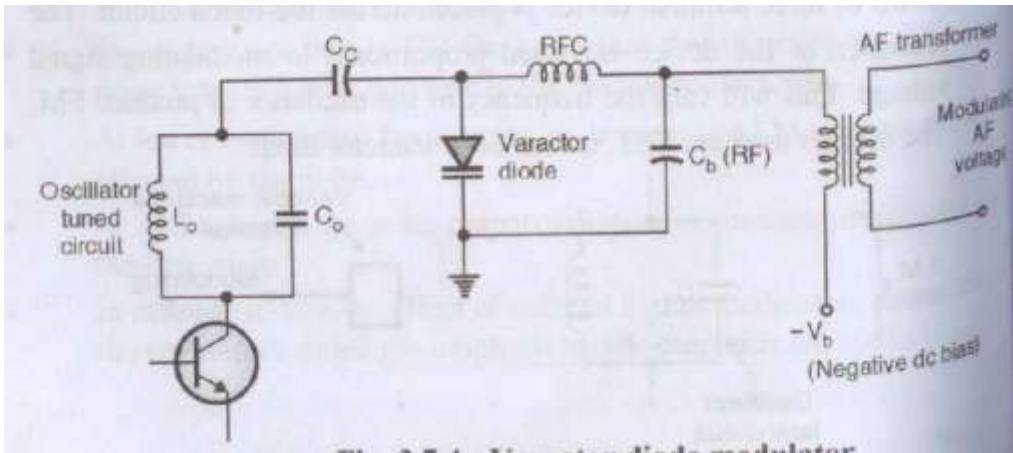(As given data is insufficient , marks can be given for attempt)

Q 3 Attempt any FOUR of the following: **16**

a) Draw a circuit for varactor diode modulator and explain it.

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ANS: (Diagram- 2 mks, explanation- 2mks)

A varactor diode is a semi-conductor diode whose junction capacitance varies linearly with the applied bias, and it must be reversed biased by a negative dc source.

The modulating AF voltage appears in series with the negative supply voltage. So the voltage applied varies in proportion with the modulating voltage , varying junction capacitance of the varactor diode. The diode is in parallel with the oscillator tuned circuit, so oscillator frequency will change with the varactor diode capacitance and FM wave is produced. The RFC will connect the DC and modulating signal to the varactor diode but offers a very high impedance at high oscillator frequency. So the oscillator circuit is isolated from the dc bias and modulating signal.

   b) Define the term:
         i.   Noise factor
        ii.   Noise voltage
       iii.   Noise figure
        iv.   Noise temperature

ANS: (Each definition – 1 mks each)

 Noise factor: For comparison of receivers or amplifiers working at different impedance levels the use of the equivalent noise resistance is misleading. For example it is hard to determine at a glance whether a receiver with an input impedance of 50 and Req=90 is better , from the point of view of noise , then another receiver whose input impedance is 300 and Req=400 .As a matter of fact ,the second receiver is the better one as will be seen.

Noise factor:- Instead of equivalent noise resistance, a quality known as **noise figure**, sometimes called as **noise factor** is defined and used. The noise figure is denoted by **F** and is defined as the ratio of the signal to noise power supplied to input terminals of the receiver or amplifier to the signal to noise power supplied to the output or load resistor.   Thus

$$F = \frac{\text{input s/n}}{\text{outputs/n}}$$

Noise voltage: It is the interfering and unwanted voltage in electronics device or system. It is measured in terms of SNR.

Noise temperature-In electronics, noise temperature is one way of expressing the level of available noise power introduced by a component or source. The power spectral density of the noise is expressed in terms of the temperature (in kelvins) that would produce that level of Johnson–Nyquist noise, thus:
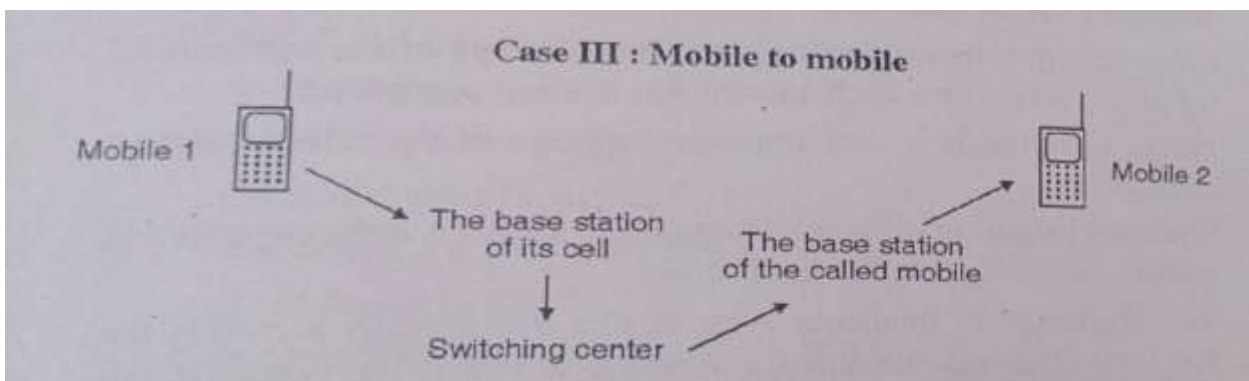
$$P/B = K_B * T$$

Where,

- P is the power (in watts)
- B is the total bandwidth (Hz) over which that noise power is measured
- K_B is the Boltzmann constant (1.381×10^{-23} J/K, joules per kelvin)
- T is the noise temperature (K)

c) **Explain call processing from mobile to mobile.**

ANS:- (proper answer 4 mks)

Case III : Mobile to mobile

1 The originating mobile unit initiates the call in same manner as it would for a mobile to wireline call.

2. The cell site controller receives caller identification number through reverse control channel which are then forwarded to MTSO.

3 . The MTSO sends a page command to all cell site controllers to locate destination party (which may be anywhere in or out service area)
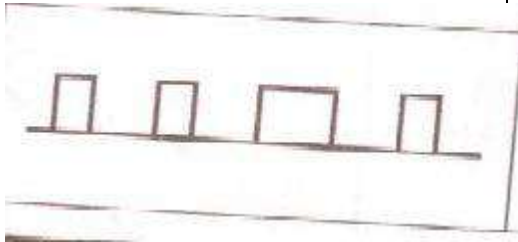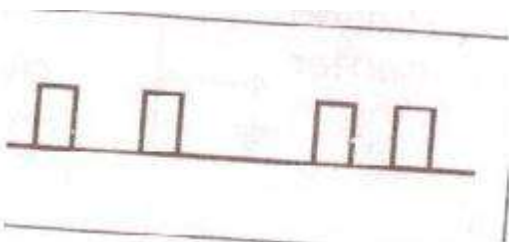
4. Once the destination mobile unit is located , the destination cell site controller sends page request through control channel to destination party to determine of the unit is on or off hook.

5. After receiving a positive response to page , ideal user channels are assigned to both mobile units.

6. Call progress tones are applied in both the directions (ring and ring back)

7. When the system receives the notice that called party has answered the call, the switches terminates the call progress tone and conversation begins.

8. If mobile subscriber wishes to initiate a call and all user channels are busy, the switch sends directed retry command instructing subscriber unit to reattempt the call through the neighboring cell.

9. If the system cannot allocate the user channels through a neighboring cell the switch transmits an intercepts message to calling mobile unit over control channel.

10. If called party is off hook ,calling party receives busy signal.

11. If called number is invalid ,the calling party receives recorded message announcing that the call cannot be processed.

d) State the difference between PWM & PPM.

ANS: (Relevant and proper 4 difference- 4 mks)

PARAMETER	PWM	PPM
(i)Transmitted power	Varies with variation in width	Remains constant
(ii) Bandwidth requirement	High	High
(iii)Output waveform		
(iv) Variable parameter of carrier	Width of carrier pulse	position of carrier pulse

e) Draw waveform for digital data 11011011 in unipolar NRZ, polar RZ, manchestor & AMI.

ANS:

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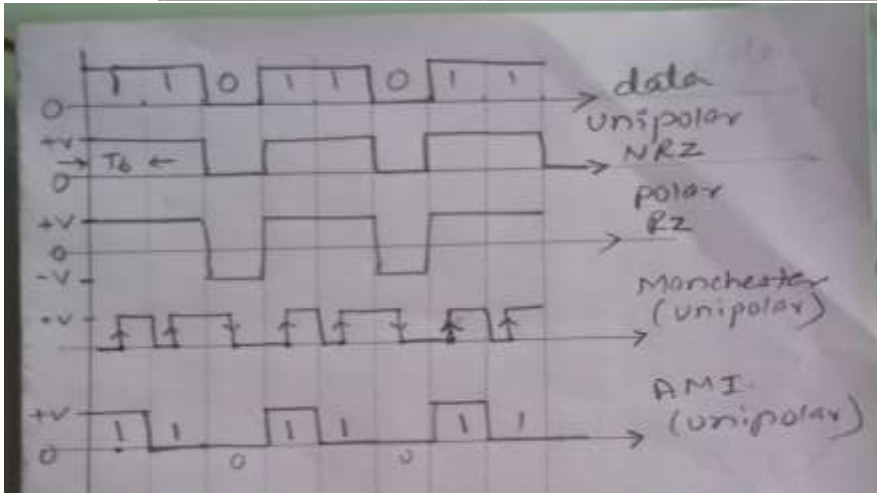
f) State the basic concept of (i) Tele dermatology (ii) Telesurgary.
ANS:

Tele-dermatology- (2 mks)
Tele dermatology is delivery of dermatologic patient care through telemedicine technologies. The dermatologist uses telecommunication equipments to evaluate clinical and laboratory data as well as diagnose and prescribe therapy for patients located at different location .Its goal is to reach underprivileged and provide services to them. It is categorized in real-time & store and forward Teledermatology.

Telesurgery- (2 mks)
Telesurgery does not exactly means doing surgery remotely .It is classified into two categories namely telemetering &telepresence .In telemetering surgeon present near patient performs surgery in consultation with distant specialist & expert surgeon .telemetering is also used for trading to student remotely who can observe surgery remotely .Telepresence surgeryused to perform micro procedure such as vascular repair & laser retinal surgery

Q 4. Attempt any FOUR of the following: 16

a) Describe the concept of frequency reuse.
ANS: (Concept -2 mks, explanation- 2 mks)

Frequency reuse- Frequency reuse is the process in which the same set of frequencies (channels) can be allocated to more than one cell. Provided the cells are separated by sufficient distance reducing each cells coverage area invites frequency reuse cells using the same set of radio channels can avoid mutual interference, provided they are properly separated. Each cell base station is allocated a group of channel frequencies that are different from those of neighboring cells & base station antennas are chosen to achieve a desired coverage pattern within its cell. However as long as a coverage area is limited to within a cells boundaries the same group of channel frequencies may be used in different cells without interfacing with each other provided the two cells are sufficient distance from one another.

Pattern for frequency reuse

K = 12 (i=2, j=2)

N = 12

b) Explain interference due to co-channel and adjcent channel in mobile communication.
ANS: (Diagram- 1 mks, explanation – 1 1/2 mks each)

Adjacent channel interference: Interference resulting from signals which are close in frequency to the desired signal is called adjacent channel interference. Adjacent channel interference results from imperfect receiver filters which allow nearby frequencies to leak in to pass band. It is serious problem can be a particularly serious if an adjacent channel user is transmitting very close range to a subscribers receiver, while receiver attempts to receive a BS on the desired channel this is referred to as near far effect.

Co channel interference:
Interference resulting from signal frequency which is immediately next to the desired signal frequency is called next channel interference.
Suppose the desired frequency of receiver is 90.3MHz. If it captures the frequency 91.3MHz transmitter then it results in next channel interference.

c) State the concept of (i) Message confidentiality (ii) Message integrity (iii) Message authentication (iv) Digital signature.
ANS: (1mks each definition)

Message confidentiality:- It is concept related to protecting message while transmission. Two or more hosts communicate securely, typically using encryption. The communication cannot be monitored (sniffed) by untrusted hosts. The communication between trusted parties is confidential

Message integrity- Is an assurance to an entity that the data has not been altered (intentionally or unintentionally) between " there" and " here" or between "then" and " now".

Digital signature-**Digital signatures** are the public-key primitives of message authentication. In the physical world, it is common to use handwritten **signatures** on handwritten or typed messages. They are used to bind signatory to the message. Similarly, a **digital signature** is a technique that binds a person/entity to the **digital** data.

Message authentication- In cryptography, a **message authentication** code (MAC) is a short piece of information used to **authenticate** a **message**—in other words, to confirm that the **message** came from the stated sender (its authenticity) and has not been changed in transit (its integrity).

d) Explain the working of bridges and routers in the network security.
ANS: (2 mks each)

Bridges- Are network devices used to connect two similar devices.

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:
Router is a device that connects two or more networks. It consists of a combination of hardware and software.
1) A router is a specialized computer connected to more than one n/w
2) Router operate at the n/w layer
3) The primary function of a router is to connect n/w together & keep layer 2 broadcast traffic under control.
4) A router is typical connected to at least two n/w commonly two LAN OR WAN or LAN and its ISP s n/w or more n/w connect.
5) Routers are located at gateways, the places where two or more n/w connect.
Types of Router
1) Static
2) Dynamic

e) With the help of block diagram explain the working of telecardiology.
ANS:- (2 mks diagram, 2 mks explanation)

Wireless medium
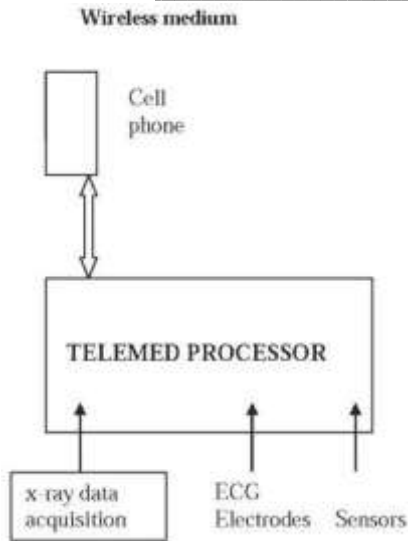
Tele-radiology system is a system used for sending raw data from a complete patient study to a remote location for a radiologist to make a final decision.

A tele-radiology system consists of an image acquisition system, an image server to compress, and a telecommunication network to transmit the images.

The input signals are analog data from electrocardiogram (ECG) acquired from conventional chest electrodes, x-ray data from x-ray data acquisition systems, or digital data from other types of physiological sensors.

The processor is a computer that can have any amount of memory. Since the signals are from many channels, multiplexing is done to send the desired signal based on a priority scheme in a particular time instant.

Signals from the telephone are transmitted.

f) State the advantages and disadvantages of telemedicine.
ANS:

Advantages:- (2 points- 2 mks)
i) Doctor can attend patient at remote location without being in front of patient physically
ii) Expenses Decreases.
iii) Doctor can attend patient immediately form remote location without traveling

Disadvantages:- (2 points- 2 mks)

i) Doctor cannot take readings by using specific instruments
ii) Lack of some clinical information
iii) It completely dependent on connectivity

5. Attempt any FOUR of the following   16

a) With the help of suitable example differentiate between synchronous and asynchronous transmission.

Ans:- (4 points – 4 mks)

| Parameter	Synchronous	asynchronous

1.	Synchronization	Needed. Here transmission is carried out are synchronized to a reference clock.	Not needed. Here transmitter commences transmission of data bytes at any instant of time.
2.	Start-Stop bits	Start-Stop bits are not used.	Used along with each data bytes
3.	Gaps between data blocks	Absent	Present
4.	Speed	High	Low
5.	Application/ example	Communication between two computers	Communication between a computer and keyboard

b) Explain the architecture of OSI model.

Ans:- (Sketch- 2 mks, explanation -2 mks)
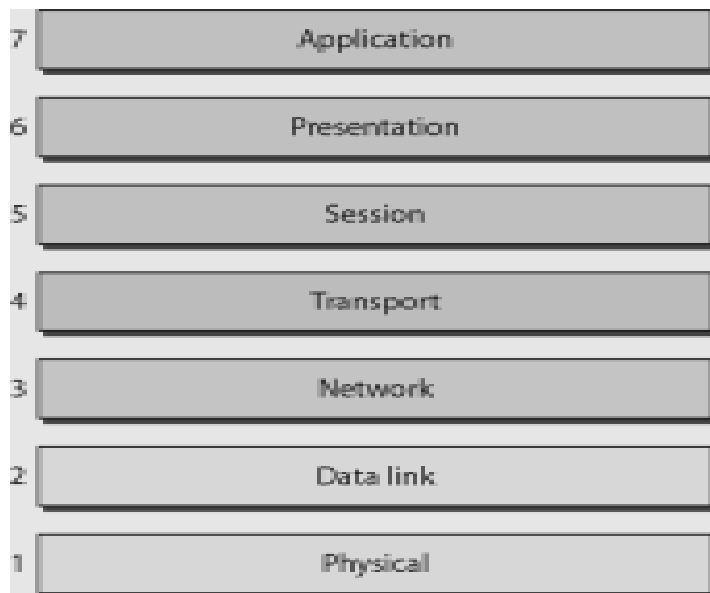
Function of each Layer:
1. **Physical Layer** : To transmit bits over medium. To provide electrical and mechanical Specifications.
2. **Data Link Layer**: To organize bits to frame .To provide hop to hop delivery.
3. **Network Layer**: To move packets from source to destination .To provide internetworking.
4. **Transport Layer**: To provide reliable process to process message delivery and error recovery
5. **Session Layer**: To establish manage and terminate session.
6. **Presentation Layer**: To translate encrypt and compress data
7. **Application Layer** : To allow access to network resources

c) Draw the block diagram of multichannel biotelemetry system for ECG.

Ans:- (block diagram – 2 mks, explanation – 2 mks)

17

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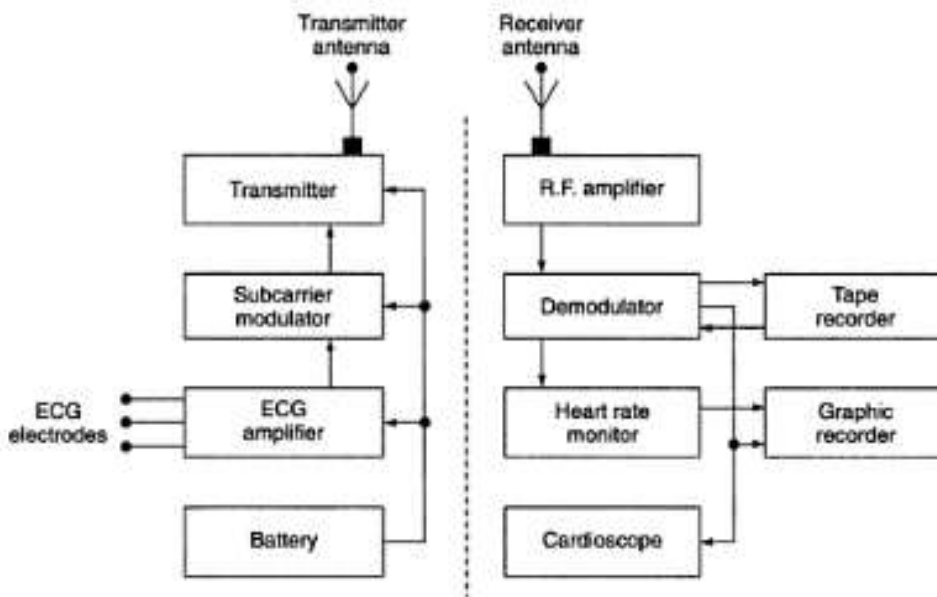
Explanation-

It consist of mainly two parts namely telemetry transmitter & telemetry receiver .

Transmitter:- signals picked up by pre gelled electrodes are amplified & modulated at frequency of 1 KHz. It is again modulated to UHF frequency. The resulting signal is radiated with of electrode lead (RL) which works as antenna .

Receiver – it uses unidirectional quarter wave monopole receiving antenna which receives signals .These signals are in turn fed to RF amplifier RF amplifier which performs RF filtering &image frequency rejection & it prevents cross coupling .The output of RF amplifier is fed to demodulator .demodulator demodulates signal & it is provided to ECG filter

d) State the advantages and disadvantages of TDMA, FDMA and CDMA.

Ans:- (Note- marks distribution is difficult, please give marks according to attempt by student)
TDMA-
Advantages
1) Provides full power efficiency
2) Requires only guard time
3) It is possible to store digital information.

Diasdvantages
1) Requires synchronization
2) Only time sharing of satellite transponder takes place.

FDMA
Advantages

1) Does not require synchronization
2) Requires only guard band

Disadvantages
1) Low power efficiency
2) Storage, enhancement of signal is not possible

CDMA

Advantages
1) Sharing of both bandwidth and time
2) No synchronization required
3) Full power efficiency is possible
4) More security

Disadvantages

1) Performance is affected because of adjacent time and frequency slots
2) Code words are required by group stations.
3) Requires both guard time and bands.
4) Due to frequency hopping the effect of adjacent channels becomes less.

e) Explain serial and parallel mode of data transmission. Give two applications of each.

Ans:- (Diagram – 1 mks each, explanation- 1 mks each)
Serial mode-In this mode data is transmitted bit by bit /serially one after other for each clock pulse. Thus it has a single data transmission line. so data rate is slow. It is generally used for low distance data transmission and long distance communication.
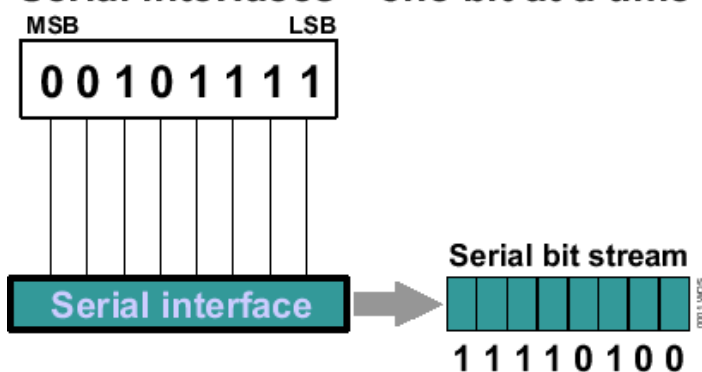
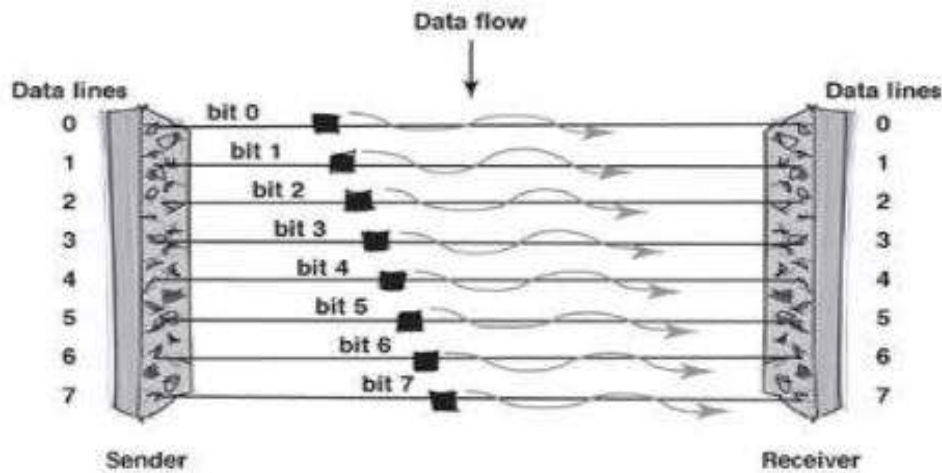Applications-(2 applications – 1mks)

1) for long distance data transmission

2) For low rate data transmission

Parallel mode-

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**

Applications-(2 applications-1 mks)

1) used for short distance
2) High data rate data transmission

f) Explain the concept of telepsychiatry and telesurgery.

Ans:- **Telesurgery-**   (**2 mks**)
Telesurgery does not exactly means doing surgery remotely .It is classified into two categories namely telemetering &telepresence .In telemetering surgeon present near patient performs surgery in consultation with distant specialist & expert surgeon .telemetering is also used for trading to

student remotely who can observe surgery remotely .Telepresence surgery used to perform micro procedure such as vascular repair & laser retinal surgery .   (2 mks)

ii) Tele psychiatry-   (2 mks)

-It involves providing psychiatric theory remotely .It involves spoken conversation between consultant & patient but does not involves transmission of any test data Real time video conferencing is used for tele psychiatry.   (2 mks)

 6. Attempt any FOUR of the following   16

a) Draw a schematic diagram of TDM and FDM system. Also state two applications of each.
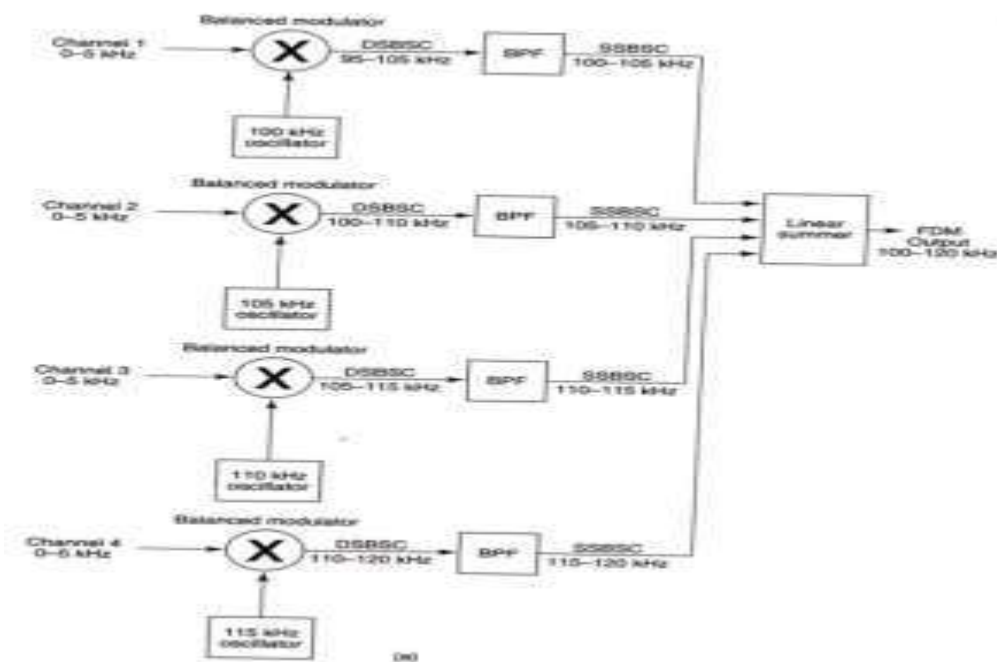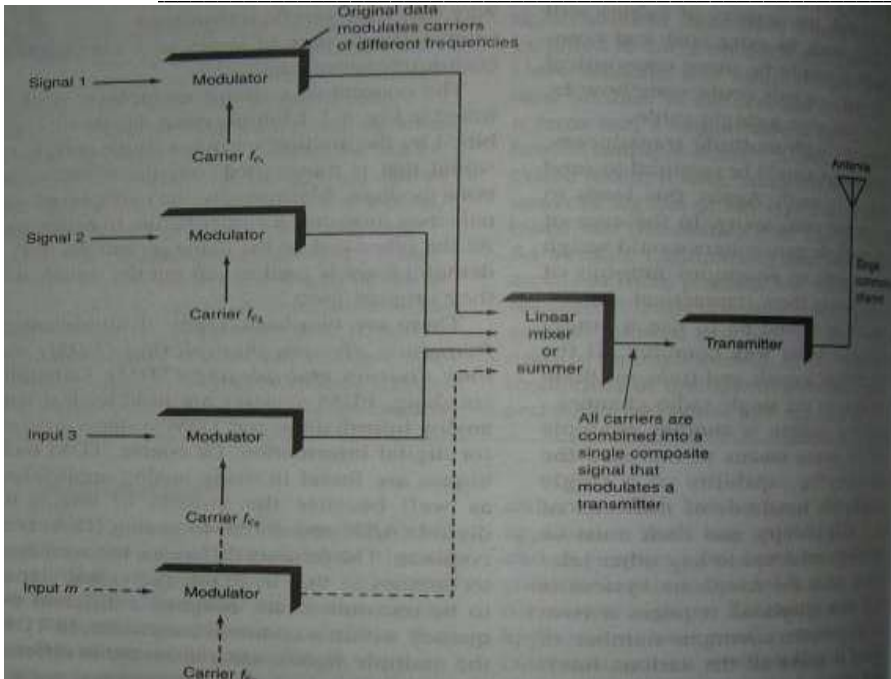
Ans:-TDM – 1mks
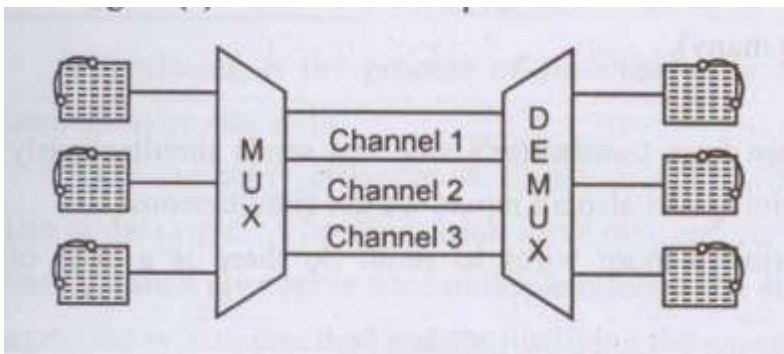
Applications:- (any 2 – 1mks)

1. In ISDN telephone lines
2. In wire line telephone system
3. some cellular telephone system.
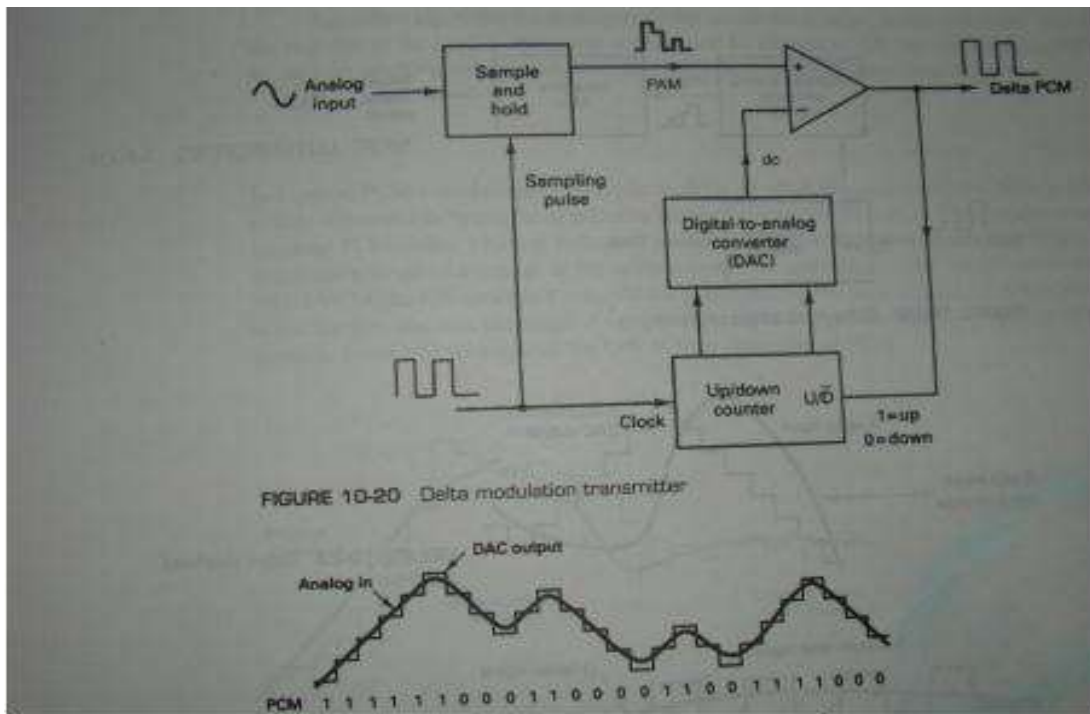4. in circuit switch networks such as PSTN.

FDM- 1mks

Applications:- (any 2 – 1mks)

1) FDM is usually preferred for the analog signal

2) Telephone exchange

3) FM Radio

_____

b) Draw a block diagram of delta modulation and explain with suitable waveforms.

Ans:- (Block diagram – 2 mks, explanation-1mks ,waveforms- 1mks)

FIGURE 10-20 Delta modulation transmitter

Operation-

In figure above, the input analog is sampled and converted to PAM signal, which is compared with the output of DAC. The output of DAC is a voltage equal to 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 up-down counter is updated after each comparison..Initially, the up-down counter is zeroed, and the DAC is outputting 0V. The first sample is taken, converted to a PAM signal, and compared with zero volts.

The output of comparator is a logic 1 condition (+V), indicating that the current sample is larger in amplitude than the previous sample. On the next clock pulse, the up-down counter is incremented to count of 1. The DAC now outputs a voltage equal to the magnitude of the minimum step size (resolution).With the input signal shown, the up-down counter follows the input analog signal up until the output of the DAC exceed the analog sample; then the up-down counter will begin counting down until the output of DAC drops below the sample amplitude

c) State two advantages and applications of QPSK and DPSK.

Ans: (½ mks for each point)

QPSK- Advantages

 1. Higher data rate (2 bits per bit interval)

2. for same bit error rate the B.W required by QPSK is reduced to half than BPSK

Applications

1) In digital TV

2) In high speed modems

3) Communication between earth stations and space shuttles.

DPSK

Advantages

1) No need of carrier recovery circuit at receiver / synchronization.

2) Errors are more as they occur in pair.

Applications

1) Higher bandwidth application

2) high speed modems

d) How global communication is achieved with geostationary satellite explain using suitable communication.

Ans:-(Proper answer -4 mks)

 Geostationary satellite remains almost stationary in respect to given earth station. Consequently, expensive   tracking equipment is not required at the earth stations. Geostationary satellites are available to all earth station within their shadow 100% of the time. The shadow of a satellite includes all the earth station that have a line of sight path to it and lie within the radiation patterns within the antennas. There is no need to switch from geostationary satellite to another as they orbit overhead. Consequently, there are no transmission breaks due to switching times The effects of Doppler shift are negligible.

e) Write the band name with its uplink and downlink frequency range used in satellite communication.

Ans:- (Any 2 bands – 2 mks each)

Band name	Uplink frequency	Downlink frequency
C	5.9 to 6.4	3.7 to 4.2
X	7.9 to 8.4	7.25 to 7.75
KU	14 to 14.5	11.7 to 12.2
KA	27 to 30	17 to 20

f) Draw basic block diagram of transponder and explain the function of each block.

Ans: -(Block diagram- 2mks, functions- 2 mks)

A communications satellite's transponder is the series of interconnected units that form a communications channel between the receiving and the transmitting antennas. It is mainly used in satellite communication to transfer the received signals.
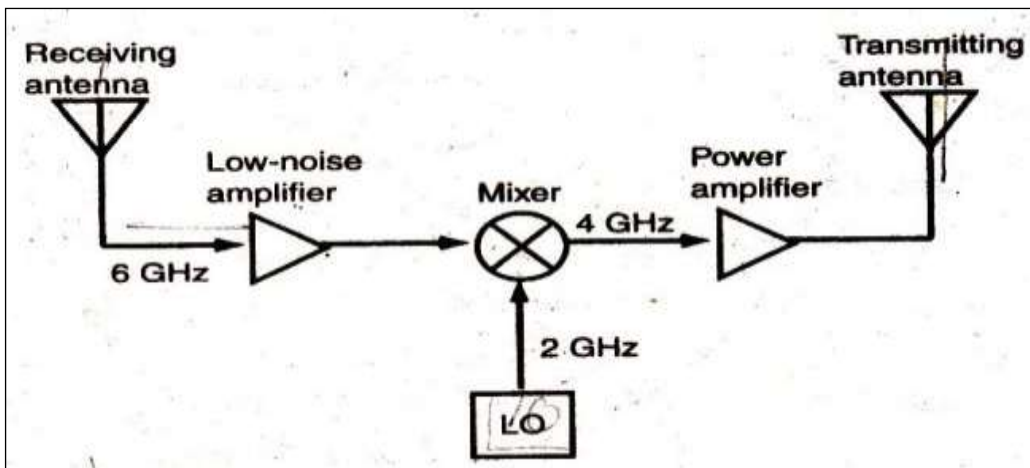
Functions-

Satellite antenna: - This antenna is used to pick up the receiving signal as well as it transmits the signal. The uplink signal is picked up by the receiving antenna and is first routed to a low noise amplifier.
Low Noise amplifier: - The signal is very weak even though it has been multiplied somewhat by the gain of the receiving antenna. LNA is used to increase the level of the signal, and the signal is amplified
Mixer: - The amplified signal is then given to the mixer and it is used to translate in the downlink frequency
Power amplifier: - The down link signal is amplified by high power amplifier
Diplexer: - The function of diplex is to isolate the uplink signal from the downlink. It avoids the interference between the uplink and downlink signal.