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WINTER– 14 EXAMINATION

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 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 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.

Q1. (A) Attempt Any Six of the Following: **(12 marks)**

(a) Define Noise factor & Noise figure.
Ans.
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 50Ω and R_{eq}=90Ω is better , from the point of view of noise , then another receiver whose input impedance is 300 Ω and R_{eq}=400Ω.As a matter of fact ,the second receiver is the better one as will be seen. Instead of equivalent noise resistance, a quality known as **noise figure**, sometimes called as **noise factor** is defined and used.   **(1 Marks)**

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.   **(1/2 marks)**

Thus

$$F=\frac{\text{input s/n}}{\text{outputs/n}}$$ **(1/2 marks)**

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(b) List any four application of satellite.

Ans. **(Any four- 1/2 marks each)**

Four Applications of satellite are:

1. Surveillance
2. Navigation
3. T.V distribution
4. Satellite telephones
5. Mobile communication

(c) State the main function of session layer and transport layer.

Ans.

1. Functions of session layer: (2 points -1 mark)

1) Defines how connections can be established, maintained and terminated.
2) Logically keeps session separate.(e.g. Google, yahoo, Gmail, etc.)
3) Synchronization of data flow.
4) Acknowledgement of data received during a session.
5) Provides duplex, half duplex or simple communication between devices.
6) Retransmission of data if it is not received by a device.

2. Functions of transport layer :-   (2 points -1 mark)

1) Sequences packets so that they can be reassembled at the destination in the proper order
2) Application identification.
3) Confirmation that the entire message arrived completely.
4) Control of data flow.
5) Put segments in correct order so they can be reassembled in correct order at destination.

(d) List any four types of digital modulation techniques

   Ans.   **(4 applications-1/2 mark each)**

   1. Amplitude Shift Keying (ASK)
   2. Frequency Shift Keying (FSK)
   3. Phase Shift Keying (PSK)
   4. Quadrature Phase Shift Keying (QPSK)
   5. Binary Phase Shift Keying (BPSK)
   6. Differential Phase Shift Keying (DPSK)
   7. M-ary FSK
   8. M-ary PSK
   9. MSK
   10.Quadrature Amplitude Phase Shift Keying (QASK)

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e) What is TDM? Where it is used?

Ans. TDM is a digital multiplexing technique to combine data. TDM is a process that allows several connections to share the high bandwidth of a link instead of sharing a portion of the bandwidth as in a FDM, time is shared in TDM.　　　　　　**(1 mark)**

Uses :-　　　　　　　　　　　　　　　　　**(any 2 -1 marks)**

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

f) What is the necessity of using hexagonal shape cell for mobile communication?

Ans:-　　**(4 points-1/2 mark each)**

1. Hexagonal model cover an entire area without overlapping,
2. Hexagon has the largest area of the above mentioned geometries,
3. Hexagonal system can be considered as the semi-realistic model.
4. Hexagon shape permits easy and manageable analysis of a cellular measurement or propagation prediction models.

g) What is Biphase concept? List its two types

Ans**.** 　 **(Concept 1 mark, types- ½ marks each)**

In Biphase code, there is always a transaction at the beginning of every bit interval.

Two types:
> 1. Biphase M-code.
> 2. Biphase S-code.

h) What is LEO? State its frequency range

Ans. **(Explanation 1 mark, frequency range 1 mark)**

Low earth orbits (LEO) are satellite systems used in telecommunication, which orbit between 400 and 1,000 miles above the earth's surface. They are used mainly for data communication such as email, video conferencing and paging. They move at extremely high speeds and are not fixed in space in relation to the earth. LEO-based telecommunication systems provide underdeveloped countries and territories with the ability to acquire satellite telephone service in areas where it otherwise would be too costly or even impossible to lay land lines.

Frequency range:-Little LEOs will operate in the 800 MHz (.8 GHz) range, big LEOs will operate in the 2 GHz or above range, and Mega-LEOs will operate in the 20-30 GHz range

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Q.1. (B) Attempt Any Two of the Following: **(8 marks)**

(a) State the bandwidth requirement for FSK, BPSK, QPSK, & DPSK.

Ans.   **(1 mark each)**

a.   Bandwidth of FSK $=(f_1 - f_0 + f_b)$
b.   Bandwidth of BPSK $=(2f_b)$
c.   Bandwidth of QPSK$= (f_b)$
d.   Bandwidth of DPSK $=(f_b)$

(b) Write step by step procedure for wire line (PSTN) to mobile (Cellular) call procedure

Ans**.   (Proper procedure 4 marks)**

1.   When a cellular phone is turned on and it is yet to be engaged in a call it first scans the group of forward channel to identify the one with the strongest signal and then monitors the control channel until the signal drops below a useable level.
2.   It again scans the control channels and searches the strongest base station signal
3.   When a telephone call is placed in a mobile user the MTSO or MSC sends the request to all the base station in the cellular system
4.   The subscriber telephone number known as MIN is then broadcast as a paging message over all of the FCCs in cellular system
5.   The mobile receives the paging message send by the base station and response by identifying itself over the RCC
6.   The base station relays the acknowledgment sent by the mobile and informs the MTSO about the handshake
7.   The MTSO instructs the base station to move the call to an unused voice channel within the cell
8.   Now the base station signals the mobile telephone to change the frequencies to an unused forward and reverse voce channel pair and another data message called an alert is transmitted over the forward voice channel to instruct the mobile telephone to ring
9.   Once the call is in progress the MTSO adjusts the transmitted power of the mobile telephone and changes the channel of the mobile unit and base station and in order to maintain call quality even when the subscriber moves in and out of the coverage area of the cell
10. This process is known as hand-off

C) **What is network topology? Describe Mesh topology**

 Ans.:-

Network topology is the arrangement of the various elements (links, nodes, etc.) of a computer **network**. Essentially, it is the **topological** structure of a **network** and may be depicted physically or logically. **(1marks)**

A network setup where each computer and network device is interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this topology is commonly used for wireless networks. Below is a visual example of a simple computer setup on a network using a **mesh topology**. **(2 marks)**

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Mesh Topology
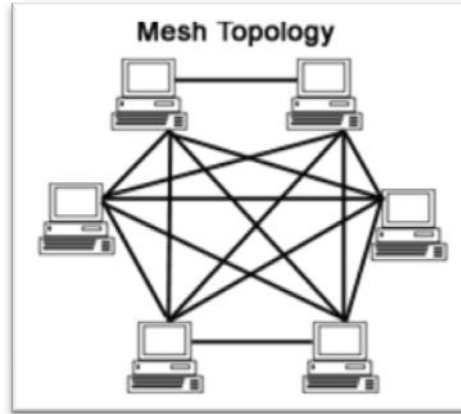
(1marks)

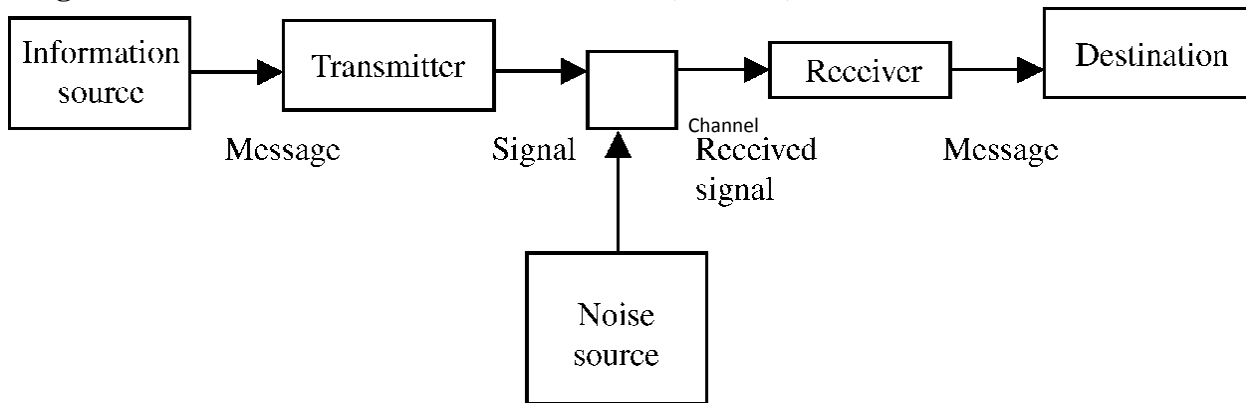**Q2.Attempt Any Four of Following** **(16 marks)**

(a) Draw and explain block diagram of communication system.
Ans.

Diagram **(2 marks)**

Function of each block: **(2 marks)**
Information or Input signal-The information can be in the form of sound, (speech or music), picture or data coming from computer.
Input transducer -Input transducer converts the original information into equivalent electrical signal.eg. Microphone, T.V camera, etc
Transmitter-Transmitter converts its electrical equivalent into suitable form. Also increase the power level of the signal to cover long range.

Communication channel or medium-Communication channel is a medium which is used for transmission of electromagnetic signals from one place to another place.

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

Receiver-Received signal is amplified, demodulated and converted back to suitable form.

Output transducer-The output transducer converts electrical signal into original form. For eg. Loudspeaker, picture tube, etc
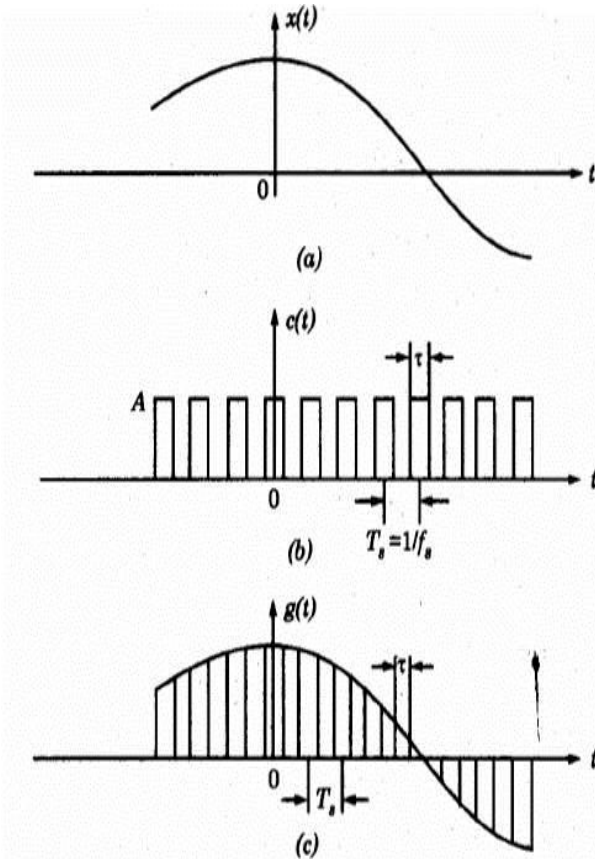
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(b) Draw and explain natural sampling and flat-top sampling.

Ans:

Natural Sampling Explanation (1 marks)

Natural sampling is a practical method that approximates ideal sampling. The analog input x (t) is multiplied by a train of uniformly spaced, rectangular pulses. If the width of the pulses is much smaller than the spacing between pulses, then natural sampling may be regarded as an approximation of ideal sampling.

**Natural sampling (1 mark)**   **Flat Top Sampling (1 mark)**
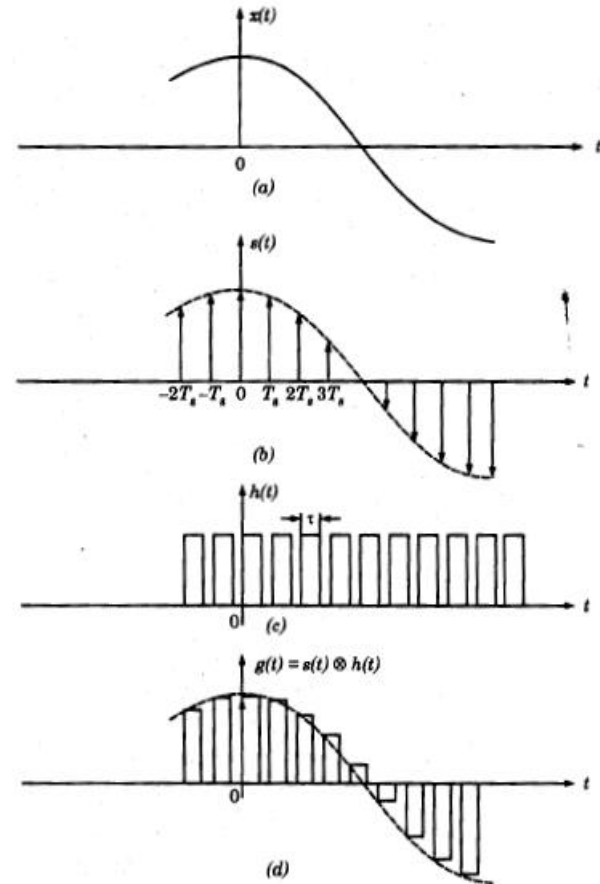
Flat Top Sampling Explanation (1 mark)

Flat top sampling is like natural sampling i.e.; practical in nature.. In this sampling techniques, the top of the samples remains constant and is equal to the instantaneous value of the message signal x (t) at the start of sampling process. Sample and hold circuit is used in this type of sampling.

(c) State the different levels used in the bipolar coding. Draw & explain AMI in detail.

Ans: Bipolar coding uses three voltage levels positive, negative and zero which is similar to polar codes. But here zero level is always used for representing the "0" is used in the data stream at the input. **(1 mark)**
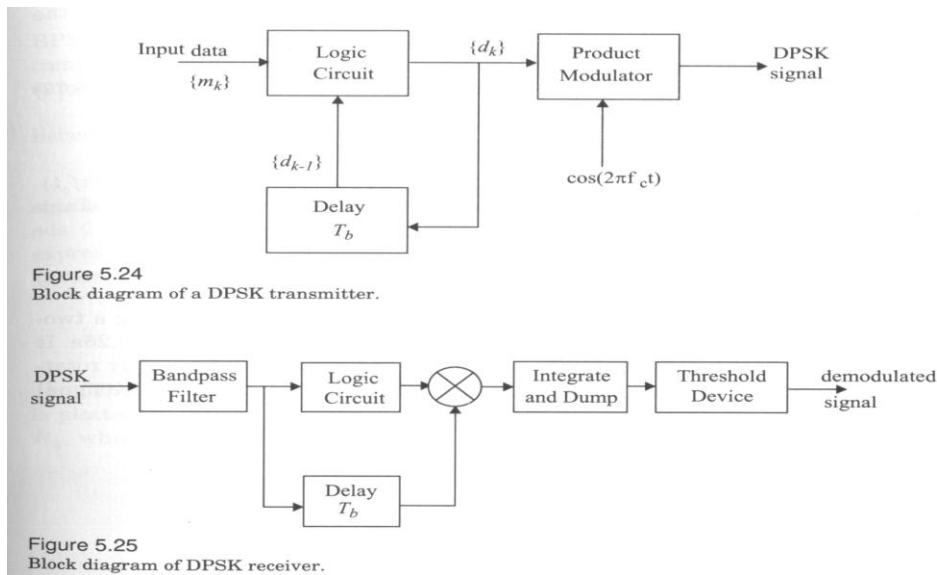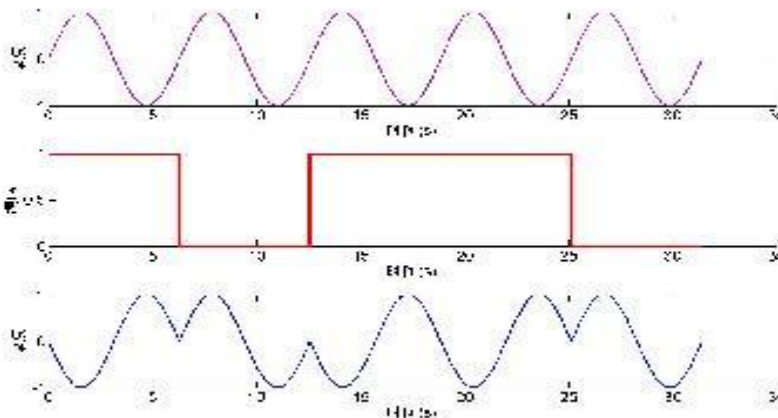
AMI:
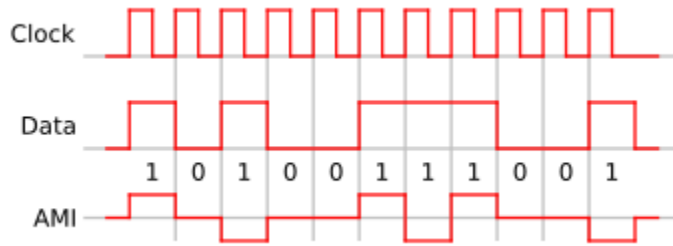
(2 marks)

- Each 1 introduces a transition that can be used for synchronization
- Error detection is possible for a single added or lost pulse.
- Since 1 signal alternate in voltage, there is no dc component.
- Bandwidth considerable smaller that in the NRZ encodings.
- Long runs of 0's don't allow synchronization. In this code, a binary 0 is encoded as zero volts, as in unipolar encoding, whereas a binary 1 is encoded alternately as a positive voltage or a negative voltage. The name arose because, in the context of a T-carrier, a binary '1' is referred to as a "mark", while a binary '0' is called a "space".. **(1 mark)**

(d) With neat sketch, explain working principle of DPSK.

Ans:-

Figure 5.24
Block diagram of a DPSK transmitter.

Figure 5.25
Block diagram of DPSK receiver.

(2marks)

(1 mark)

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Explanation (1 mark)

DPSK is treated as non-coherent version of PSK.

It combines two basic operations, namely,

1. Differential encoding
2. Phase shift keying

Hence the name DPSK.

This type phase reveals takes place when the signal passes through the telephone switching networks.

DPSK will eliminate this ambiguity about whether the received data was inverted or not

(e) Define modulation index for FM. Calculate the modulation if frequency deviation of carrier is ±25KHZ and maximum modulating frequency is 10KHZ.

Ans: modulation index m_f is given by

$$m_f = \frac{fequency\ deviation}{modulating\ frequency}$$

$$m_f = \frac{\delta}{fm}$$

Knowing the modulation index, we can compute the number and amplitude of the significant side bands. This is done though through a complex mathematical process known as Bessel function.
(2 marks)

Solution:-

Given:- $\delta_{max} = 10$ kHz

$\delta = +25$ kHz

% Modulation $= \frac{25\ kHz}{10\ kHz}$
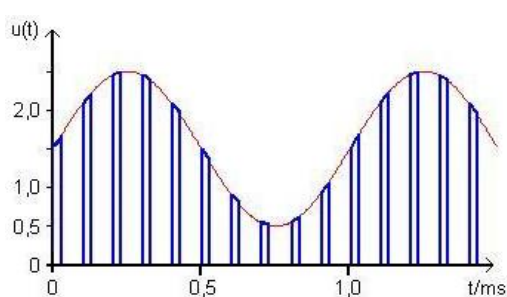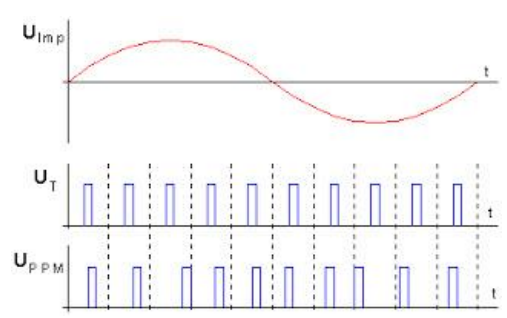
% Modulation $= 2.5$ %   **(2 marks)**

(f) Compare PAM & PPM on the basis of

(i)   Transmitted power   (iii)   Output waveform
(ii)   Bandwidth requirement   (iv)   Noise immunity

Ans :-   **(4 marks for proper points)**

PARAMETER	PAM	PPM
(i)Transmitted power	Varies with amplitude of pulses	Remains constant
(ii) Bandwidth requirement	Low	High
(iii)Output waveform		
(iv)Noise immunity	Low	High

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Q 3. Attempt any four from following:- **(16 marks)**

a) 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 $f_s \geq 2w$.   **(1 mark)**
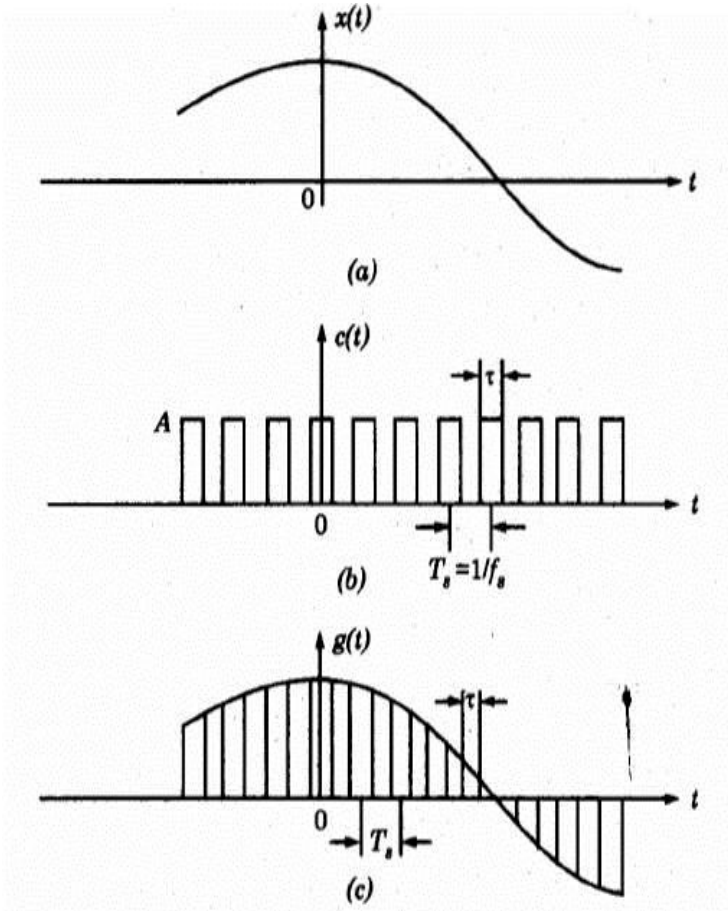
(1 mark)

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.
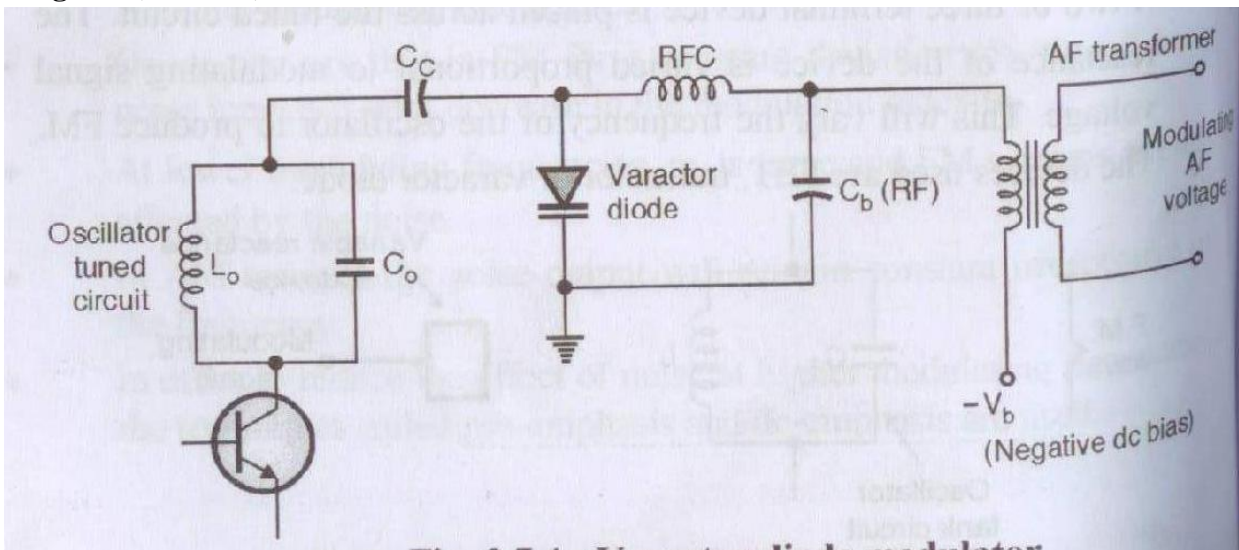
$$T_s = 1 / f_s = \text{Sampling Period.}$$

$$F_s = 1/ t_s = \text{Sampling rate}$$

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b) Draw and explain FM modulation circuit using varactor diode.

Ans:-

Diagram (2 marks)

Explanation (2 marks)

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 very high impedance at high oscillator frequency. So the oscillator circuit is isolated from the dc bias and modulating signal.

c) What is cell? What are types? State the major drawback of cell splitting

Ans.

Cell: The basic geographic unit of a cellular communication system is called as cell. **(1 mark)**

The cell splitting is of two types – **(2 marks)**

a) Permanent cell splitting

b) Dynamic cell splitting.

Drawbacks: (2 points-1 marks)

1) Major drawback of cell splitting is causes more base station transfer per call and higher processing load per call.
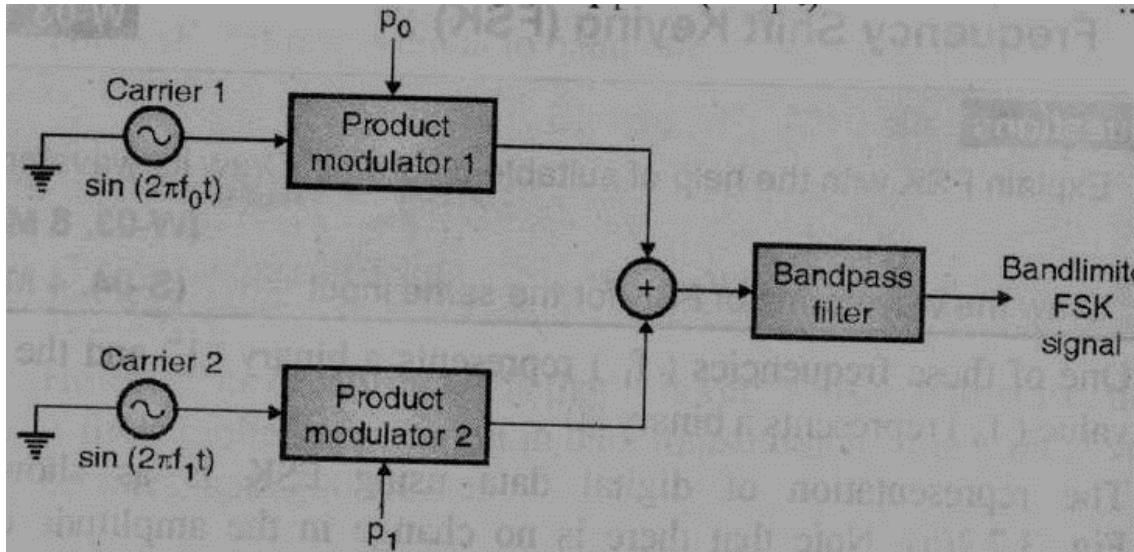
2) No of hands off are more.

d) What is FSK? State its principal .Draw the diagram to generate FSK.

Ans.

FSK is digital modulation technique in which frequency of carrier signal is varied (shifted) in accordance of bit value of modulating signal & keeping amplitude & phase constant. **(1marks)**

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Diagram (1 mark)

It consists of two oscillators which produce sine wave at frequencies f1, f0 respectively. The oscillators output are applied to input of two multipliers .The other input to the two multipliers are signal p1 & p0 .The relation hip between p1 & p0 & data bit d(t) is as follow

Bit value of data	Value of d(t)	Value of P_0	Value of p_1
Binary 0	-1	1	0
Binary 1	+1	0	1

When a binary 0 is transmitted p0=1 & p1=0, therefore the output of first modulator is present & and frequency of transmitted signal is f0.Similarly when binary 1 is to be transmitted p0=0 & p1=1, therefore the output of second multiplier only is present and frequency of transmitted signal is f1.It is represented by

V_{Fsk}=P0sin $(2\pi f0t)$ + P1sin $(2\pi f1t)$.   **(1 mark)**
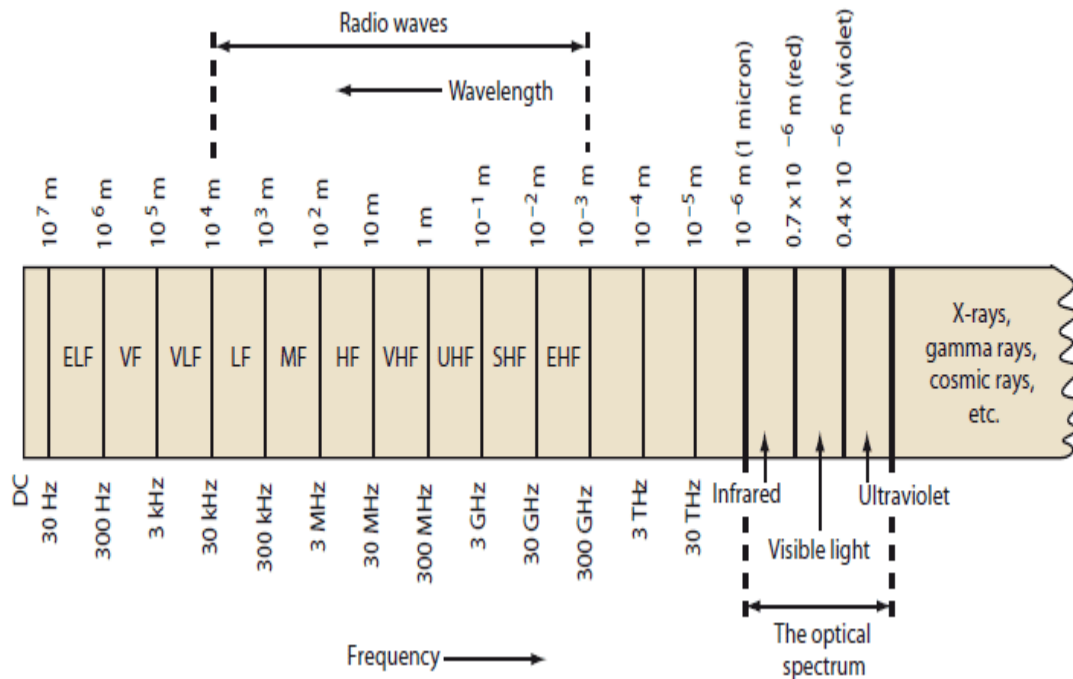
As shown in waveform whenever bit value of data changed from 1 to 0 or 0 to 1 frequency of output have been changed.

Waveforms (1 mark)
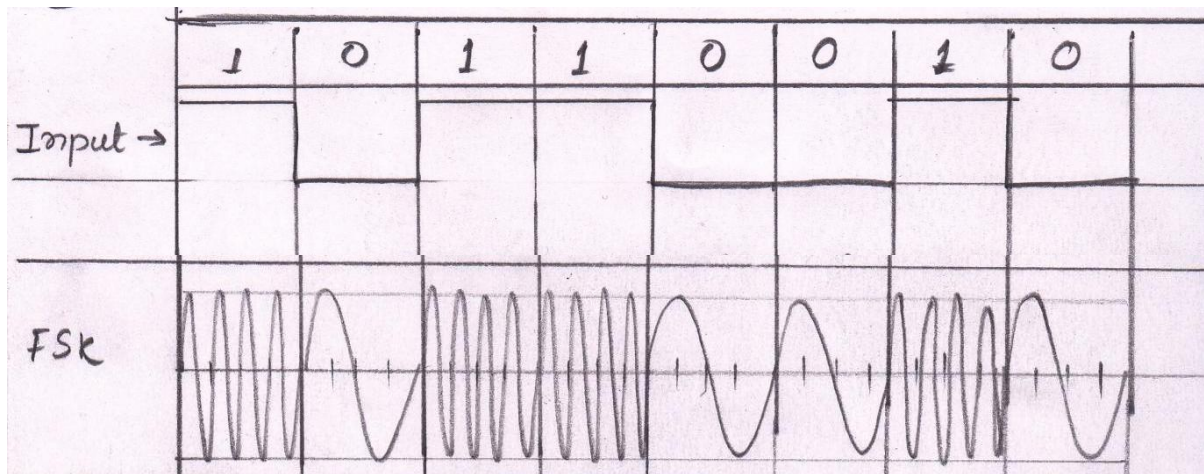
e) Draw electromagnetic frequency spectrum range & write its description.

Ans. (diagram 2marks, Description 2marks)

(OR)

Spectrum	Range(freq.)
Extremely Low frequency ELF	30-300 Hz
Voice Frequency (VF)	300-3000Hz
Very Low frequency (VLF)	3-30 KHz
Low Frequency (LF)	30-300KHz
Medium Frequency (MF)	300KHz-3MHz
High Frequency (HF)	3-30Mhz
Very High Frequency (VHF)	30-300MHz
Ultra High Frequency (UHF)	300MHz-3 GHz
Super High Frequency (SHF)	3-30GHz
Extremely High Frequency (EHF)	30-300 GHz
Infrared	30 to 430THz
Visible Light	375-750THz

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f) Explain any two advantages & disadvantages to telemedicine.

Ans.   (2 marks advantages, 2marks disadvantages)

Advantages:-

i)   Doctor can attend patient at remote location without being in front of patient physically

ii)   Expenses Decreases.

Disadvantages:-

i)   Doctor cannot take readings by using specific instruments

ii)   Lack of some clinical information

iii)   It completely dependent on connectivity

Q 4 Attempt any Four of the following: (16 marks)

a)   What is hand off? List four basic steps involved in hand off process.

Ans.

Hand Offs - When a mobile user travels from one area of coverage or cell to another cell within a call's duration the call should be transferred to the new cell's base station. Otherwise, the call will be dropped because the link with the current base station becomes too weak as the mobile recedes. Indeed, this ability for transference is a design matter in mobile cellular system design and is call *handoff*.   **(1 mark)**
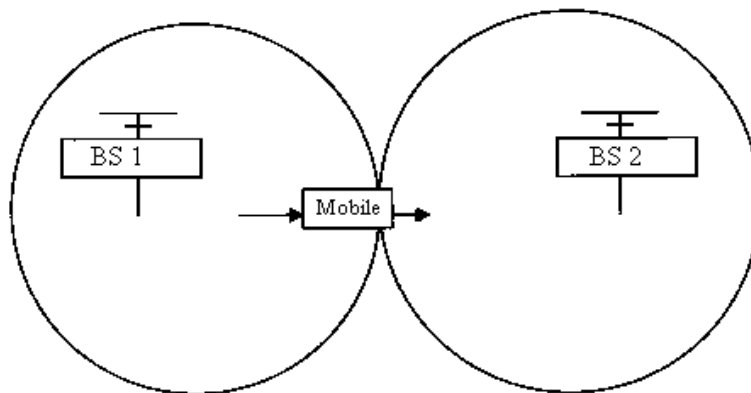
   **(1 mark)**

Steps involved in hand off process: **(2 marks)**

i)   Measurement

ii)   Initiation

iii)   Decision

iv)   Execution

b)   What is co channel & adjacent channel interference?

Ans.

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. **(1 mark)**

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Diagram (2 marks)
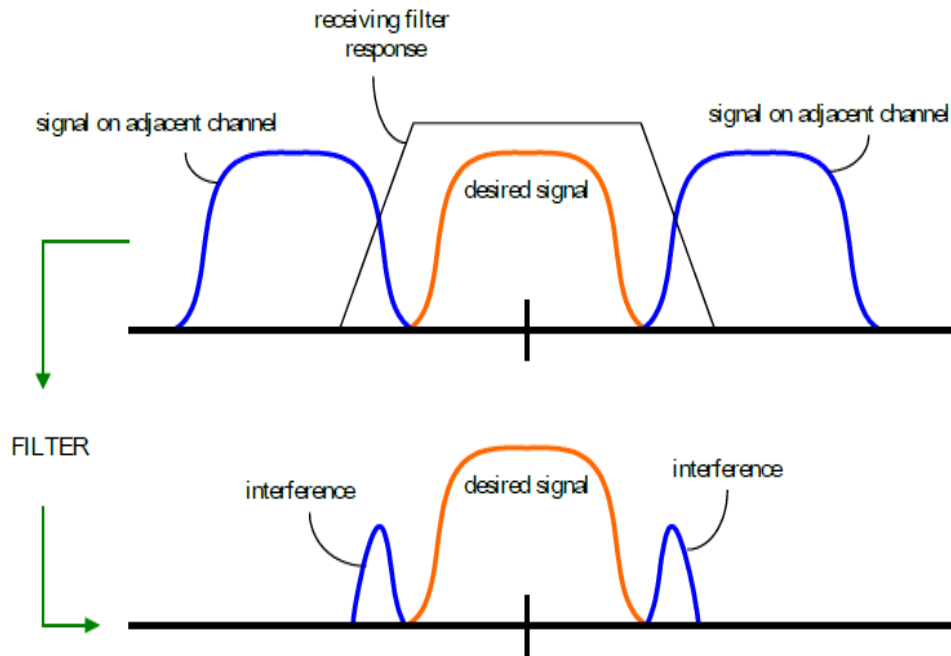
Co channel interference:

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.   **(1 marks)**

c) State one application for repeater, bridge, router & Gateway.

Ans: (1 marks each)

1) Repeater: - It is physical layer device .It receives amplifies and retransmits signal in both direction it is used in long distance wired or wireless data transmission for long distance data or telephone

2) Bridge: - It is used to connect different network segments

3) Router: - It is used to connect computer or severs to internet

4) Gateway: - It is used to interconnect two different type networks like AppleTalk & Ethernet

d) Explain the term Digital signature & message integrity related to network security.

Ans:-

Digital signature: - Digital signature is an electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged.   **(2 marks)**

Message Integrity: - The assurance to an entity that data has not been altered (intentionally or unintentionally) between "there" and "here," or between "then" and "now."   **(2 marks)**

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e) State the basic concept of following :

i)   Tele psychiatry   ii)   Tele dermatology

Ans:-

**Tele psychiatry-**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 marks)**

Tele dermatology- 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 tele dermatology.   **(2 marks)**

f) Draw basic block diagram of single channel biotelemetry system for ECG & explain each block.

Ans:- (Diagram 2 marks, explanation 2 marks)
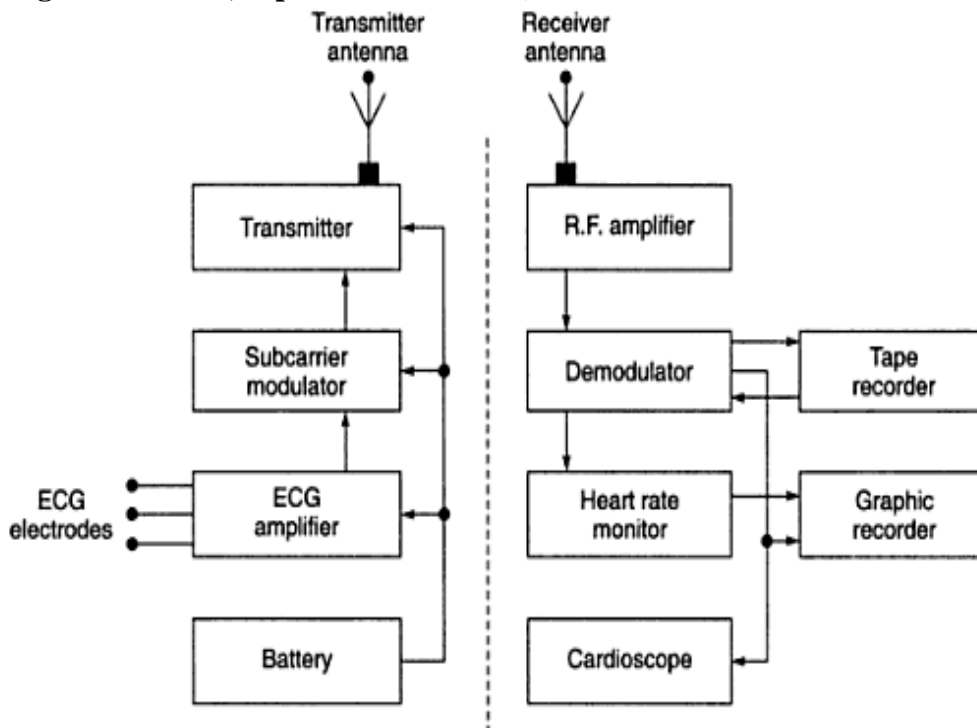
➤ **Fig. 9.5** *Block diagram of a single channel telemetry system*

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.

Q 5 Attempt any Four from following: (16 marks)

a) Compare star & bus topology on the basis of

i) Arrangement of nodes	iii) Unit used for data transmission
ii) Standard used	iv) Ease of installation & maintenance

Ans. **(1marks each Point)**

	Star topology	Bus Topology
Arrangement of node	all nodes are connected to single centralized communication Hub	Each node is connected to its two ad sent neighbor (except terminal nodes) forming liner architecture
Standard used	802.3	802.4
Unit used for data transmission	10to 100 MBPS	10 MBPS
Ease of installation & maintenance	Easy To install & fault finding	comparing with star somewhat complex to maintain

b) What are different types of data transmission? Compare serial & parallel communication.

Ans. **(Note: half duplex, full duplex can be also considered)**

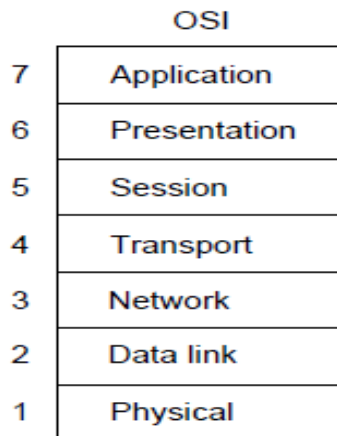Types of data transmission **(2 marks)**

i) parallel

ii) serial:-
   a) asynchronous
   b) synchronous
   c) Isochronous

Comparison **(4 points- 2 marks)**

Serial communication	Parallel communication
Data is transmitted bit by bit	multiple bits are transmitted simultaneously
Data rate is low	Data rate is high
Cost is low	Cost is High
Generally used for long distance data transmission or low rate data transmission	Generally used for short distance High data rate data transmission

c) Draw architecture of OSI model & explain the use of Physical & data link layer.

Ans:-

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              OSI
    ┌───┬──────────────────┐
  7 │   │ Application      │
    ├───┼──────────────────┤
  6 │   │ Presentation     │
    ├───┼──────────────────┤
  5 │   │ Session          │
    ├───┼──────────────────┤
  4 │   │ Transport        │
    ├───┼──────────────────┤
  3 │   │ Network          │
    ├───┼──────────────────┤
  2 │   │ Data link        │
    ├───┼──────────────────┤
  1 │   │ Physical         │
    └───┴──────────────────┘
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(2 marks)

Physical Layer   (2 points - 1marks)
i)   Bit to signal transformation
ii)   Bit rate control
iii)   bit syncronisation
iv)   Multiplexing switching

Data link Layer   (2 points -1 marks)
i)   Framing
ii)   Flow control
iii)   Error control
iv)   congestion control

d) With a schematic diagram define angle of elevation & azimuth angle.

Ans.   (diagram 2 marks, definition 1 marks each)

Azimuth angle: The angle produced by intersection of local horizontal plane and the plane passing through the earth station the satellite and center of earth.

Elevation angle: It is defined as the angle by which the antenna foresight should be rotated in the vertical plane that contains the satellite direction from the horizontal to the satellite direction.

Diagram
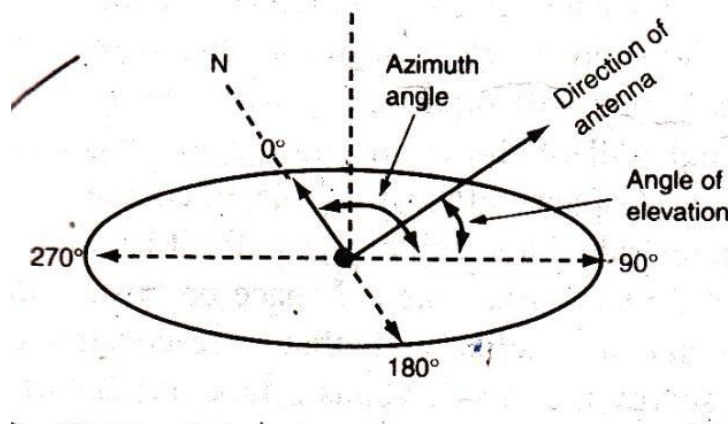
e) Compare & WAN w.r.t. following point s
i)   Speed   iii)   Basic structure diagram
ii) Area of coverage   iv)   Application

Ans:- (Each correct point – 1 mark)

Points	LAN	WAN
1) Speed	High	Slow
2) Geographical area	Limited Geographical area of few kilo meters	It covers a large area, it can operate Worldwide
3) Basic structure diagram		
4)Application	limited distance in building or inter building data transmission ,sharing resources	Long distance like intercontinental data transmission like internet ,long distance telephony

f)   What is tele-radiology? Describe briefly its operation with block diagram.
Ans
Tele-radiology is electronic transmission of radiological images from one location to another for the purpose of interpretation and or consultation.   **(1 mark)**

Applications: (Any 2 applications- 1 mark)
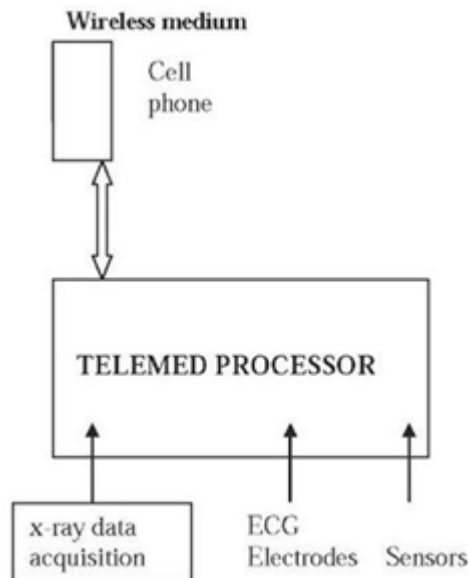
(2 marks)

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1. Radiologist if having digital audition device for x-ray images, can provide consultation in remote location including both direct interaction with patient and availability of relevant data.
2. It can be used by surgeons to review pre postoperative radiograph of patient without physical presence of patient.
3. Consultation (second review) of on go specialist can be taken

Q 6   Attempt any Four of the following: (16 marks)

a)   What is FDM? List advantages & disadvantages.

Ans.   (explanation 2marks, 2 advantages & disadvantage 1 marks each)

Frequency Division Multiplexing (FDM) is based on the idea that number of signals can share the bandwidth of a common communication channel. The multiple signals to be transmitted over this channel are each used to modulate a separate carrier. Each carrier is on a different frequency. The modulated carrier are then added together to form a single complex signal that is transmitted over the single channel.

Advantages:-

1) Simple to generate

2) Low cost

Disadvantages:-

1) Frequency Gap is required

2) adjacent channel interference

b)   What is delta modulation? What are its limitations? How it is overcome?

Ans.   (2 marks description, 1 marks limitation, 1 marks methods of overcoming)

It is modulation technique in which analog signal is represented by binary bit by considering increase or decrease in voltage level .firstly converting analog data into time discrete pulses (PAM) & then encoding them into bit depending on increase or decrease of voltage level of pulses.

Limitations of Delta modulation

i)   slope overload distortion

ii)   Granular Noise

Methods of overcoming:-

i)   slope overrun reduction method:-it can be reduced by increasing step size

ii)   Granular noise reduction method:- granular noise can be reduced by decreasing step size

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c) With a basic block diagram explain the principal of operation of PCM.

Ans. **(2marks block diagram 2 marks operation principle)**
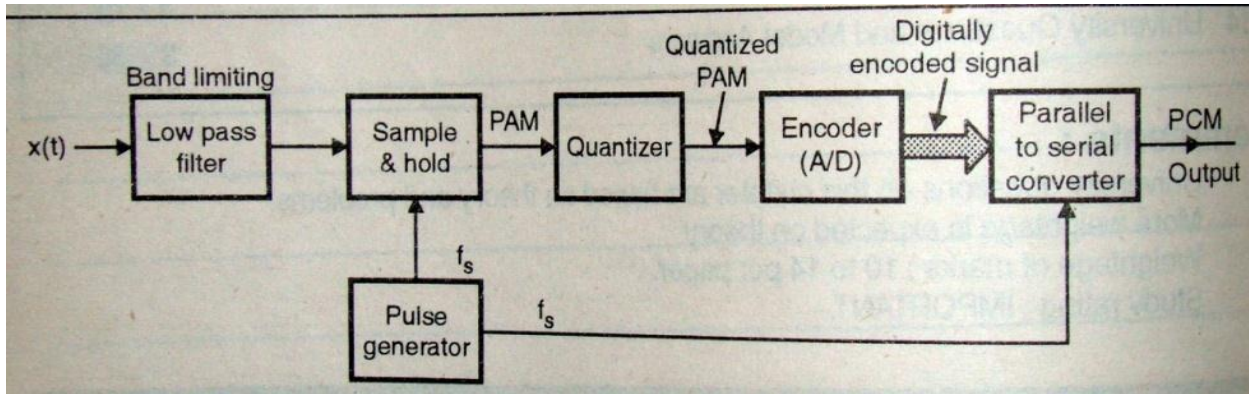
Operation of PCM:-

The analog signal x (t) is passed through a band limiting low pass filter, which has a cut-off frequency fc =W Hz. This will ensure that x (t) will not have any frequency component higher than "W". This will eliminate the possibility of aliasing.

The band limited analog signal is then applied to a sample and hold the circuit where it is sampled at adequately high sampling rate. Output of sample and hold block is a flat topped PAM signal.

These samples are then subjected to the operation called "Quantization" in the "Quantizer". The quantization is used to reduce the effect of noise. The combined effect of sampling and quantization produces the quantized PAM at the quantizer output.

The quantized PAM pulses are applied to an encoder which is basically an A to D converter. Each quantized level is converted into an N bit digital word by the A to D converter. The value of N can be 8,16,32,64 etc. The encoder output is converted into a stream of pulses by the parallel to serial converter block. Thus at the PCM transmitter output we get a train of digital pulses.

d) Draw the schematic diagram for satellite orbital pattern & describe Apogee, Perigee, major axis & minor axis.

Ans. **(2 marks orbital Pattern ½ marks each definition)**
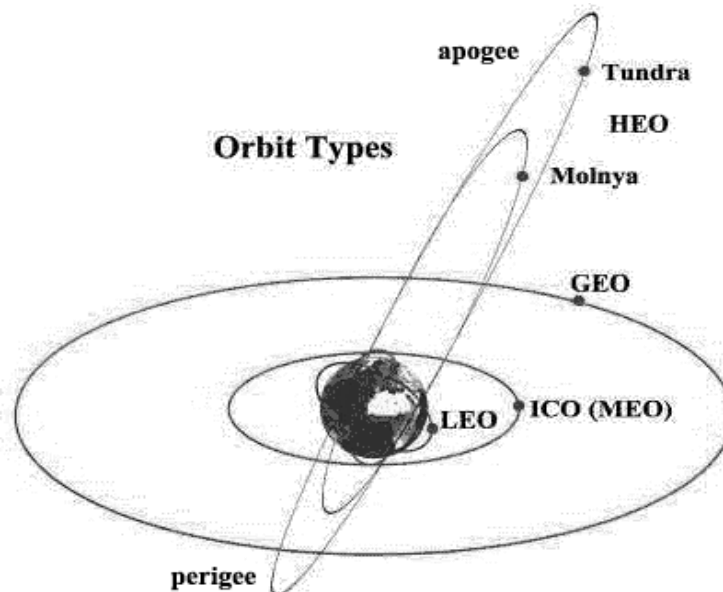
(OR)
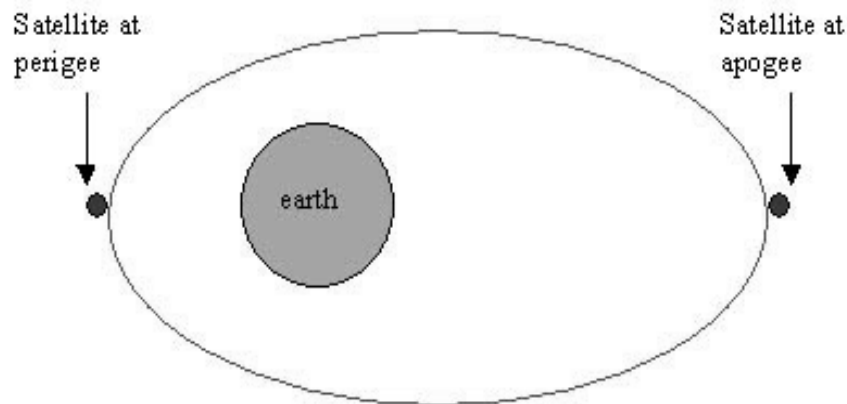
**Perigee:** It is shortest point along elliptical orbit from earth
Apogee: It is farthest point along elliptical orbit from earth
Major axis: Larger symmetric axis passing through the geo centre of elliptical orbit.
Minor axis: Smaller symmetric axis passing through the geo centre of elliptical orbit

e) Draw basic block diagram for communication satellite.
Ans. (4 marks for diagram)

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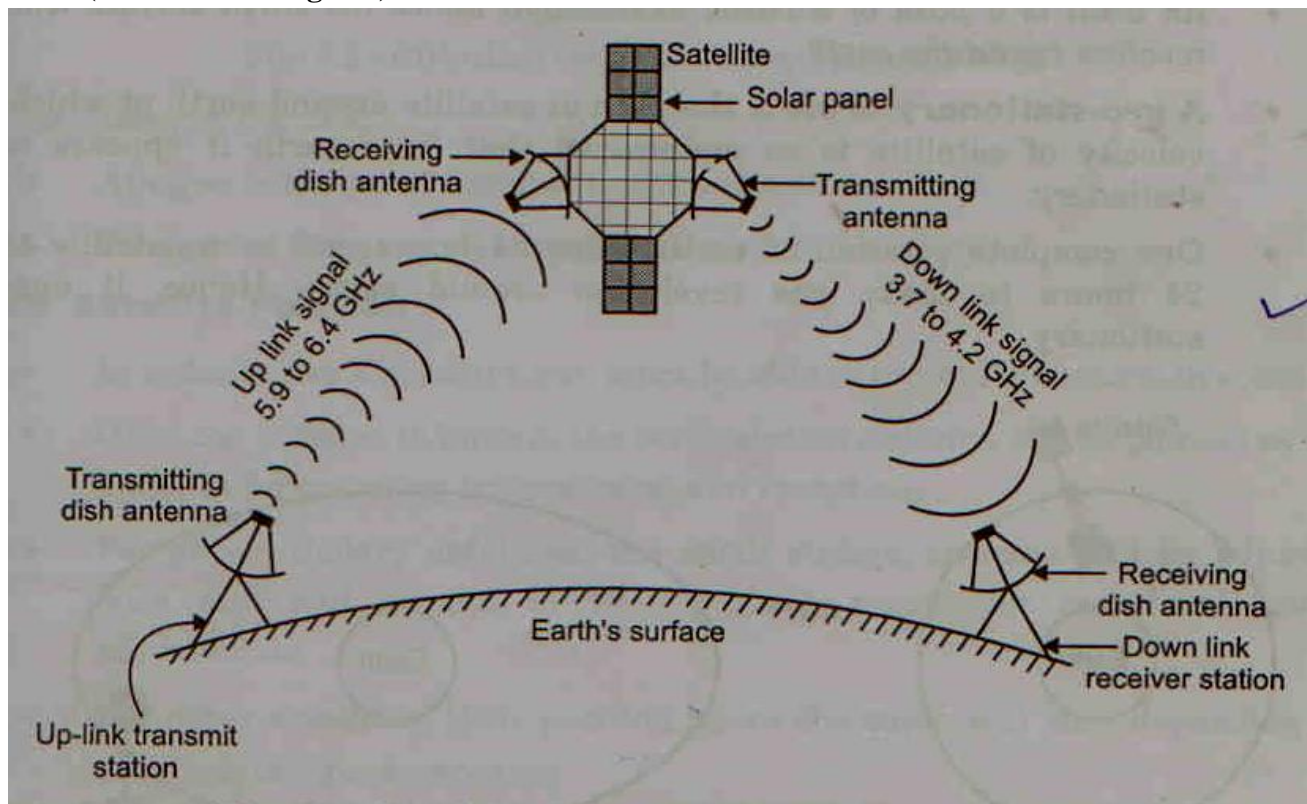
f) What is transponder used in satellite? Describe the block diagram for satellite transponder in detail

Ans. **(transponder 1 marks, diagram 1 marks 2 marks description)**

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
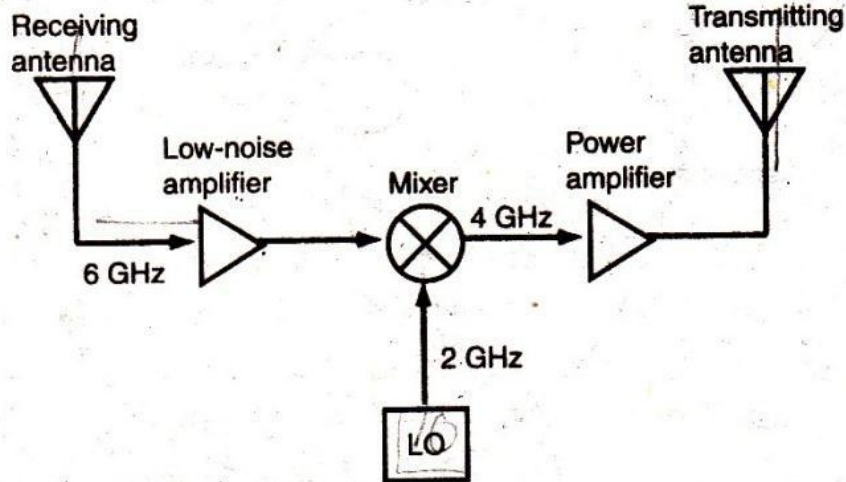
Operation:-
Satellite antenna: - This antenna is used to pick up the receiving signal as well as it transmits the signal. The uplink signal is picked up by the receiving antenna and is first routed to a low noise amplifier.
Low Noise amplifier: - The signal is very weak even though it has been multiplied 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.