



WINTER – 2022 EXAMINATION
Model Answer

Subject Name: Mobile and Wireless Communication.

Subject Code: 22533

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.
- 8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students in first year (first and second semesters) write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub Q.N.	Answer	Marking Scheme
Q.1		Attempt any Five of the following	10 M
	a)	List the wireless network generation with its example.	2M
	Ans	wireless network generation 1. 1G example AMPS, TACS, and NMT 2. 2G example GSM and IS-95 3. 3G example W-CDMA 4. 4G example LTE, WiMAX	Each generation with its example 1/2 M
	b)	List any four types of Handoff strategies.	2M
	Ans	Types of Handoff strategies 1. Hard Handoff. 2. Soft Handoff. 3. Queued Handoff. 4. Delayed Handoff. 5. Intersystem Handoff.	One type ½ M



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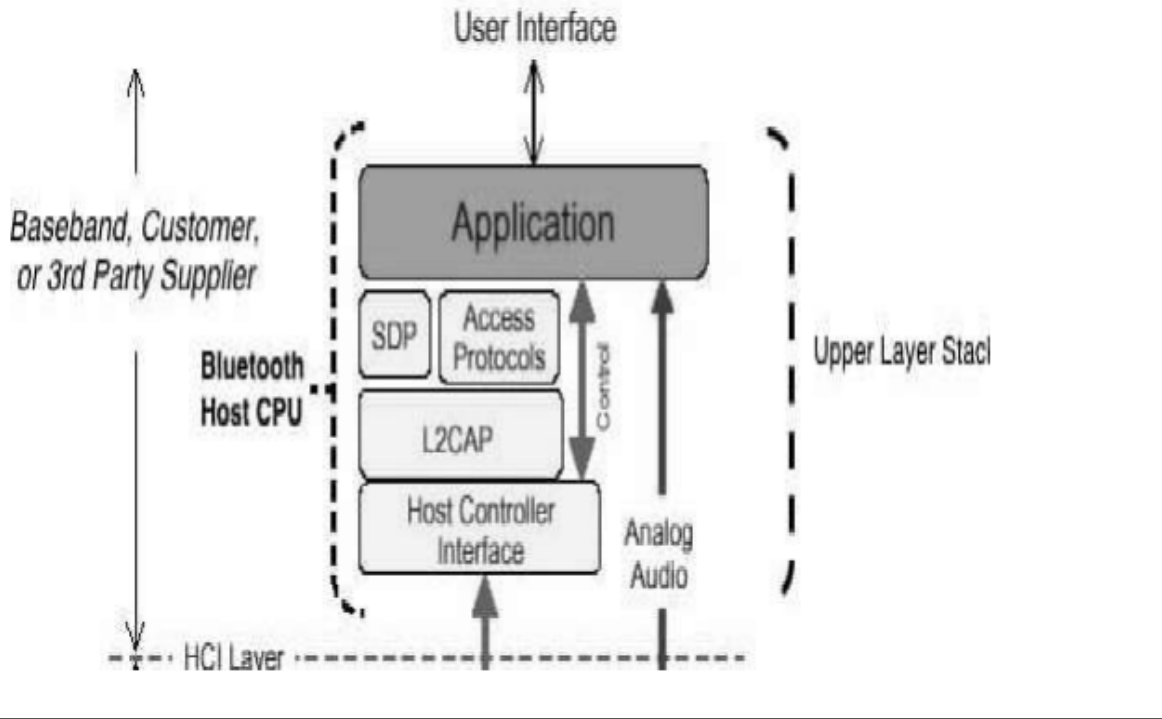
		6. Intersystem Handoff. 7. Network controlled Handoff (NCHO) 8. Mobile Assisted Handoff (MAHO)	
	c)	State the four Advantages of CDMA 2000 over 3G-GSM.	2M
	Ans	Advantages of CDMA 2000 over 3G-GSM 1. Increased voice capacity. 2. Higher data throughput. 3. Multicast Services. 4. Frequency band flexibility. 5. Migration paths. 6. Serves multiple markets. 7. Supports multiple service performances. 8. Full backward compatibility. 9. Increased battery life. 10. Power control.	One Advantage ½ M
	d)	State the four Application of MANET.	2M
	Ans	Application of MANET: It is used in following applications 1. Defense applications 2. Crisis management applications 3. Telemedicine 4. Tele-geoprocessing application 5. Virtual Navigation 6. Education via the internet 7. Vehicular area network	One Application ½ M
	e)	Draw the Architecture of Bluetooth technology.	2M
	Ans	Architecture of Bluetooth technology	2M for diagram



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f)	Explain Mobile Assisted Handoff.	2M
Ans	<p>A mobile assisted handoff (MAHO) is a process used in GSM cellular networks where a mobile phone assists/helps the cellular base station to transfer a call to another base station.</p> <p>It is a technique used in mobile telecom to transfer a mobile phone to a new radio channel with stronger signal strength and improved channel quality.</p>	2M for correct answer
g)	Describe the security procedure for W-CDMA.	2M
	<p>Security procedure for W-CDMA.</p> <p>To achieve security, the following steps are taken</p> <ul style="list-style-type: none"> • The user is allocated a temporary identity (TMSI or P-TMSI) and is identified by that. • After a small duration, this temporary identity is changed. • In addition to this, the user data that might reveal the user's identity is ciphered. 	2M for correct answer



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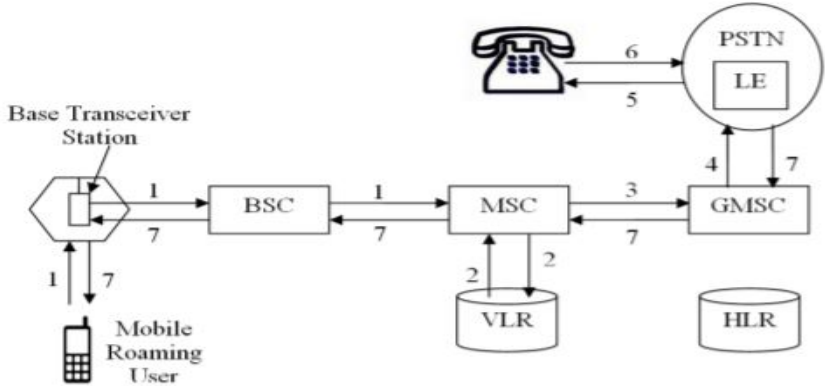
Q.2		Attempt Any THREE of the following	12M
	a)	Define the following terms i) Cell ii) Mobile Switching center iii) Cluster c Base station	4M
	Ans	i) Cell: A cell is the geographic area that is covered by a single base station in a cellular network. ii) MSC (Mobile-services Switching Center): The Mobile-services Switching Center (MSC) is an exchange that performs all the switching and signaling functions for mobile stations located in a geographical area designated as the MSC area. iii) Cluster: A cluster is group of cells in which no frequency is reused within a cluster. Frequencies used in one cell cluster can be reused in another cluster of cells. iv) Base station: base station serves as central control for all users within that cell.	1M each
	b)	MANET is also known as Infrastructure Less network Justify.	4M
	Ans	(ANY OTHER RELEVANT JUSTIFICATION CAN BE CONSIDERED) <ul style="list-style-type: none">● Mobile ad hoc networks (MANETs) are envisioned to become key components in the 4G architecture, and ad hoc networking capabilities are expected to become an important part of overall next-generation wireless network functionalities.● Mobile ad hoc networks are formed dynamically by an autonomous system of mobile nodes that are connected via wireless links without using an existing network infrastructure or centralized administration.● The nodes are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably.● Such a network may operate in a standalone fashion, or may be connected to the larger Internet.● Mobile ad hoc networks are infrastructure less networks since they do not require any fixed infrastructure such as a base station for their operation.	4M to any relevant justification
	c)	Explain mobile originated call procedure with the help of diagram.	4M



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<p>Ans</p>	<p>MOBILE CALL ORIGINATION: ⇒ Initially when the user enters the called number and presses the send key, the Mobile Station (MS) establishes a signaling connection to the Base Station System (BSS) on a radio channel. This may involve authentication and ciphering. Figure shows the sequence of call setup procedures:</p>  <p style="text-align: center;"><i>Mobile call origination call flow.</i></p> <p>⇒ Once this is done, the call setup procedures will take place as follows:</p> <ol style="list-style-type: none"> 1. The MS sends the dialed number indicating service requested to the MSC (via BSS). 2. The MSC checks from the VLR if the MS is allowed the requested service. If so, MSC asks the BSS to allocate necessary resources for the call. 3. If the call is allowed, the MSC routes the call to the Gateway MSC (GMSC). 4. The GMSC routes the call to the Local Exchange (LE) of called user. 5. The LE alerts (applies ringing) the called terminal. 6. Answer back (ring back tone) from the called terminal to the LE. 7. Answer back signal is routed back to the MS through the serving MSC which also completes the speech path to the MS. 	<p>2M Diagram 2M Explanati on</p>
<p>d)</p>	<p>4G technology has better voice clarity than 3G technology.</p>	<p>4M</p>
<p>Ans</p>	<p>(ANY OTHER RELEVANT JUSTIFICATION CAN BE CONSIDERED) Compared with most broadband, however, this simply doesn't stack up. 4G, on the other hand, is delivering speeds higher than the average broadband speed: nearly 15 Mbits per second download and a speed greater than 2 Mbits 97 percent of the time.</p>	<p>4M to relevant Justificati on</p>



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4G uses packet switching instead, as with the rest of the IP communication infrastructure. This means that data from all users travels in the same pipeline and is allocated as it comes through. There is the potential for delays, but the infrastructure is only used when there is data flowing through it, instead of being reserved for individuals even when unused.

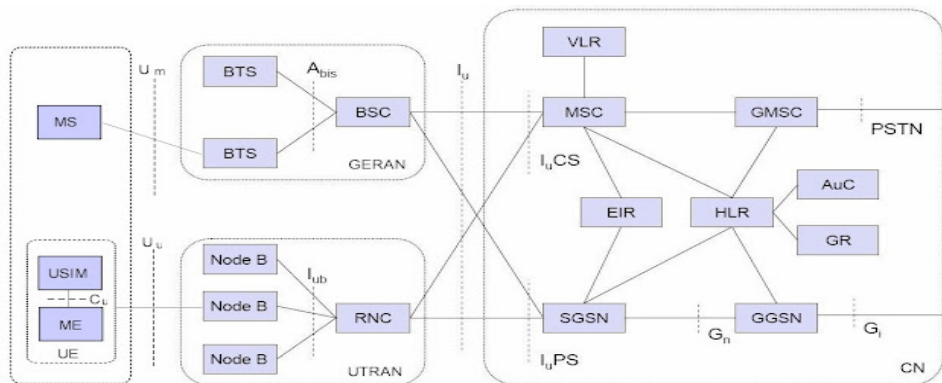
3G VoIP calling was difficult to recommend: the latency was high enough to be noticeable and the lack of bandwidth often meant greatly reduced call quality. You could make a video call, at least in theory, but not in any realistically useful sense.

4G, on the other hand, delivers real Mobile Broadband: low latency and high bandwidth, allowing you to take advantage of any enterprise VoIP features made available to you, as though you were connected directly to the network.

Q.3 Attempt any Three of the following 12M

a) Explain the block diagram of WCDMA with the help of diagram. 4M

Ans. Block diagram of WCDMA



User Equipment (UE)

1. Mobile Equipment (ME) consisting of Terminal Equipment (TE), Terminal Adapter (TA) and Mobile Termination (MT).
2. UE also contains a SIM card in UMTS, it is termed as Universal Subscriber identity module (USIM). It contains the international mobile subscriber identity number (IMSI) as well as the mobile station international ISDN number (MSISDN). USIM also contains a short message area that allows messages to stay with the user even when the phone is changed.

UMTS Terrestrial Radio Access Network (UTRAN)

Diagram 2M & explanation 2M



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3. RNS is equivalent to Base station Sub System (BSS) of GSM networks. As BSS consists of two elements BTS and BSCs. RNS also has two main elements, Node B and Radio Network Controller (RNC). In UMTS terminology, Base Transceiver Station (BTS) is known as Node B and Base Station Controller (BSC) as RNC.
4. Each RNS contains several Radio Network Controllers (RNCs), each of which controls one or several Node Bs, similar to GSM, where BSC controls one or many BTSs. The Functions of RNCs in UMTS networks is same as functions of BSC in GSM/GPRS networks. The main difference is that RNCs have more built-in intelligence than their GSM/GPRS counterparts. For example, RNCs can manage handovers without involving MSCs.
5. Node B is responsible for radio transmission and reception in one or more cells to / from the user equipment, air interface processing and radio resource management functions. It communicates with UE and RNC and in turn RNC communicates to the core Network.

Core Network (CN)

1. The CN used for UMTS is based upon the combination of the circuit switched elements used for GSM and packet elements used for GPRS and EDGE.
2. CS domain is used for providing voice and CS data services and PS domain is used to provide packet-based services.
3. The circuit switched elements are Mobile Switching Centre (MSC), Visitor Location Register (VLR), and Gateway MSC (GMSC).
4. The packet switched elements are serving GPRS Support Node (SGSN), Gateway GPRS Support Node (GGSN).
5. Some network elements are common in both domains such as EIR, HLR, VLR and AUC, their functions are same as described in GSM.
6. The CN connects the different RNSs with each other and other networks, like ISDN and data packet networks

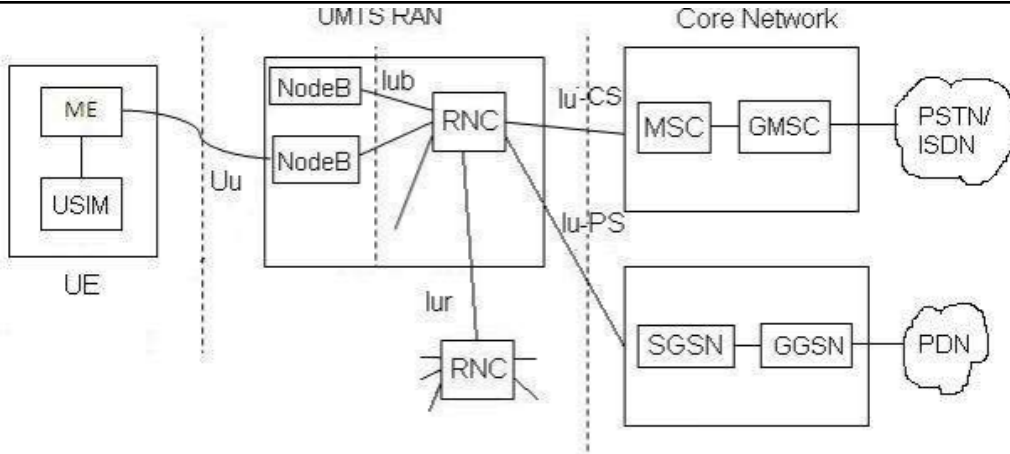
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User

Equipment (UE): The User Equipment or UE is the name given to what was previous termed the mobile, or cellphone. The new name was chosen because the considerably greater functionality that the UE could have. It could also be anything between a mobile phone used for talking to a data terminal attached to a computer with no voice capability.

- Radio Network Subsystem (RNS): The RNS also known as the UMTS Radio Access Network, UTRAN, is the equivalent of the previous Base Station Subsystem or BSS in GSM. It provides and manages the air interface for the overall network.
- Core Network: The core network provides all the central processing and management for the system. It is the equivalent of the GSM Network Switching Subsystem or NSS. The core network is then the overall entity that interfaces to external networks including the public phone network and other cellular telecommunications networks.

b) Sketch the block diagram of Transmitter section of Mobile Unit.

4M

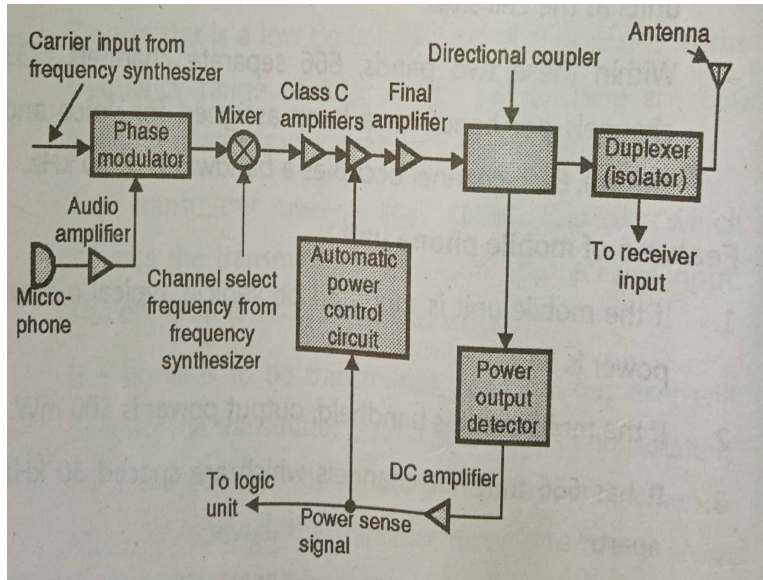
Ans. Block diagram of Transmitter section of Mobile Unit



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c) “For covering large area, Wi-MAX is used compared to WLAN” Justify the answer with the help of advantages of Wi-MAX.

4M

Ans. Advantages of Wi-MAX

1. Coverage: The single station of WiMAX can operate and provide coverage for hundreds of users at a time and manage sending and receiving of data at very high speed with full of network security.
2. High Speed: The High speed of connectivity over long distance and high-speed voice makes it more demanded in hardly populated areas plus compacted areas.
3. Multi-functionality: WiMAX Technology perform a variety of task at a time such as offering high speed internet, providing telephone service, transformation of data, video streaming, voice application etc.
4. Infrastructure: WiMAX infrastructure is very easy and flexible therefore it provides maximum reliability of network and consent to actual access to end-users.
5. Low-cost network: WiMAX provides a low-cost network substitute to Internet services offered via ADSL, modem or local area network.
6. Rich Features: WiMAX Technology is offering rich features, which make it useful. WiMAX offers separate voice and data channel for fun, the semantic connection makes your network more secure than before, fast connectively, license spectrum, liberty of movement

Because of these advantages of Wi-MAX , Wi-MAX is used compared to WLAN For covering large area

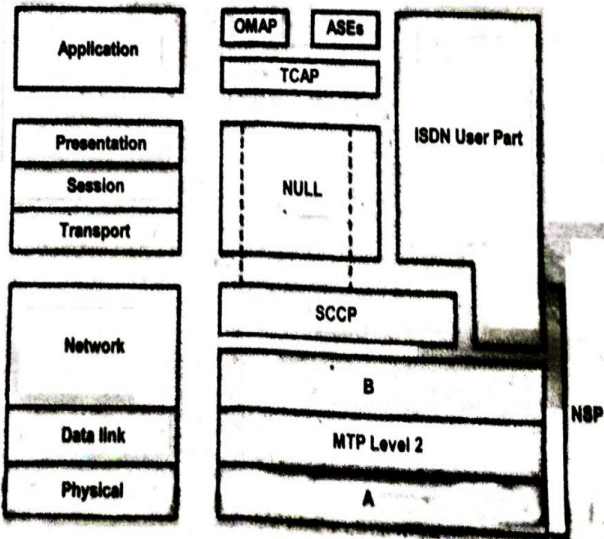
Each advantage 1M



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d)	<p>i) Name the Block diagram shown in figure No. 1. ii) Identify the block “A” and “B” in given block diagram. iii) State the function block “A” and “B”.</p>  <p style="text-align: center;">Fig. No. 1</p>	4M
Ans.	<p>i) Signaling system SS7 ii) Block “A”: MTP Level 1, block “B”: MTP Level 3 iii) Function of block “A” : MTP Level 1 signaling data link functions provides an interface to actual physical channel. The communication takes place over this communication channel. Function of block “B” : MTP Level 3 is signaling network functions. it would provide procedures for the transfer of messages between signaling nodes.</p>	<p>i) 1M ii) 1M iii) function of each 1M</p>
Q.4	Attempt Any THREE of the following	12M
a)	Explain the features of IS-95.	4M
Ans.	<p>Features of IS-95 (any four with explanation)</p> <ol style="list-style-type: none"> 1. Diversity 2. Power control 3. Soft handoff 	4M



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4. IS-95 system capacity

5. Soft capacity

6. Quality of service

7. Economics

1) Diversity

- The cellular system are having tendency to multipath fading and diversity methods of some are required to mitigate the effect of fading.
- Type of diversity in CDMA is:
- Time diversity: - Provided by symbol interleaving, error detection & correction coding
- Frequency diversity: - provided by 1.25MHz
- Space (path) diversity: - Multipath signals accepted by Receiver

2) Power control

- For the CDMA system to work efficiently the RF power in the system need to be controlled.
- All the transmission from mobile must receive at base station receiver at approximately the same strength (within 1dB).
- To maximize the no. of users sharing a cell, only minimum RF power required for reliable communication.

3) Soft handoff

- The soft handoff in a CDMA system results from system capability to simultaneously deliver
- signal to mobile through more than one cell.

4) System capacity

Key parameters that determine capacity of CDMA are as follow:

- a. Processing gain ratio of spreading code information data rate (W/R).
- b. Ratio of energy per bit to noise power (E_b/N_0)
- c. Voice activity factor

5. Soft Capacity:

- In FDMA and TDMA, N channels can be used virtually without interference from other users in the same cell but potential users $N+1$, $N+2$, ..., are blocked until a channel is released.
- The capacity of FDMA and TDMA is therefore fixed at N users and the link quality is determined by the frequency reuse pattern.



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- However, in CDMA, all the users in all cells share one radio channel and are separated by codes.
- Therefore, an additional user may be added by sacrificing somewhat the link quality, with the effect that voice quality is just slightly degraded compared to that of the normal N -channel cell.

b) Differentiate between GSM and IS-95 standards.

4M

Ans. (ANY OTHER RELEVANT POINTS CAN BE CONSIDERED)

1M each Point

Parameters	GSM	IS-95
Forward Channel Frequency	935-960 MHz	869-894 MHz
Reverse Channel Frequency	890-915 MHz	824-849 MHz
Channel Bandwidth	25 MHz with 200 kHz/channel, 8 timeslots/channel	1.25 MHz
SIM Card	Yes	No
Multiple Access	TDMA	CDMA
Handoff	Hard Handoff	Soft Handoff
System Capacity	Fixed and limited	Flexible and higher than GSM
Modulation	0.3 GMSK	OQPSK

c) “For video conferencing which generation of mobile communication is best suited ?” Justify the answer with proper reasoning.

4M

Ans. (ANY OTHER RELEVANT JUSTIFICATION CAN BE CONSIDERED)

4M

- 4G systems aim to provide ultrahigh transmission speeds of up to 100 Mbps, 50 times faster than those in 3G networks.
- This leap in transmission speed will enable high-bandwidth wireless services, allowing users to watch TV, listen to music, browse the Internet, access business programs, perform real-time video streaming.
- Wimax2 and LTE-Advance Used in 4G technology which helps the network to conduct smooth video conferencing.
- 4G uses packet switching instead, as with the rest of the IP communication infrastructure.

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Video conferencing does not have to be data-intensive. A low-quality videoconference call will use around 270MB per hour.

d) Explain the Microcell zone concept with its diagram.

4M

Ans.

- When the sectoring is employed in the cell, it leads to increase in number of hand-offs.
- This results in an additional load on the switching and control link elements of the cellular mobile system.
- This is a problem of major concern, which should be avoided.
- The solution to this problem is based on a *microcell zone* concept for seven cell frequency reuse.
- Therefore there is a necessity of a microcell zone concept to be used to overcome the major problem of hand-off.
- **A smaller geographic coverage area of a base station with the diameter less than 2 km each of which allocated a number of RF channels is called a microcell.**
- The limitations of a microcell are based on the accuracy of vehicle locations and control of the radiation patterns of the antenna used in a cellular system.
- This concept is very useful along highways or in the busy urban areas.
- The basic structure of a microcell zone system is as shown in Figure.
- It consists of three zone sites represented as T_x/R_x a zone sector, base site equipment etc.
- This system can be applied to analog and digital systems.
- Each of the three (or possibly more) zone sites are connected to a single base station and share the same radio equipment

2M
Diagram
2M
Explanati
on

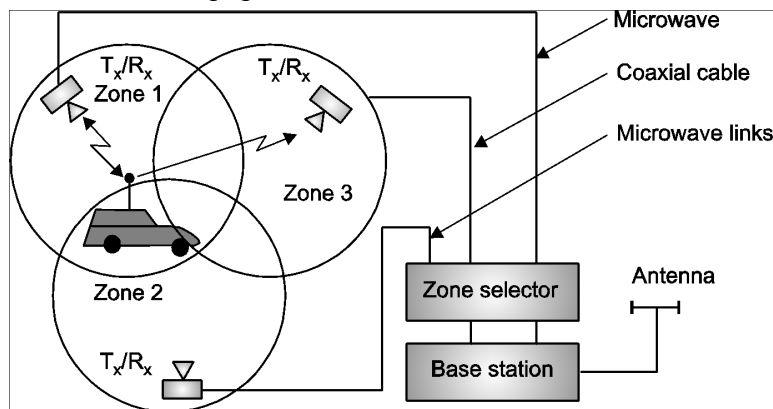


Figure: Basic structure of the microcell system

- The transmission media used for connecting the zones are connected by coaxial cable, fiber-optic cable, or microwave link to the base station.



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	<ul style="list-style-type: none">• The multiple zones and a single base station make up a cell.• The base site equipment can be located at one zone site or at any remote place.• The base site stores a zone selector, a scanning receiver, and a set of radio channels.• The micro-system can be attached to a regular macro cell site (could be a different cellular Vendor's equipment), and can be used without any modification on the base-site controller.• Also the micro-system can operate alone, if the controller is replaced with an independent microprocessor, either has to connect to the MTSO.• So each cell consists of a base station and multiple zones. <p>As a mobile unit travels within the cell, it is served by the zone with the strongest signal.</p>	
e)	State eight visions of IMT 2000.	4M
Ans.	<p>The vision of IMT 2000 are as follows:</p> <ul style="list-style-type: none">• It supports multiple environments such as cellular, cordless satellite LAN"s.• It provides global seamless roaming and service delivery across the INT 2000 networks.• It supports the VHE (Virtual Home Entertainment) and UPT (Universal Personal telecommunication). It provides security and enhances performances.• It provides global coverage by integrating the terrestrial and satellite systems.• It provides 2 Mbps data rates for indoor environments.• It makes use of Intelligent Network• Networks capabilities.	$\frac{1}{2}$ M each Vision
Q.5	Attempt any Two of the following:	12 M
a)	i) Name the block diagram shown in figure No.2 ii) Identify the block "A" and "B" in the given block diagram. iii) State the functions of block "A" and "B"	6M
Ans	<p>i) The block diagram shown in figure is of "Transmitter section of the mobile phone unit".</p> <p>ii) Block A Name: Directional coupler, Block B Name: Power output Detector</p> <p>iii) Function of Directional Coupler: A directional coupler is used to tap received power and convert it into a proportional D.C. signal.</p>	1M 2M 1.5M each



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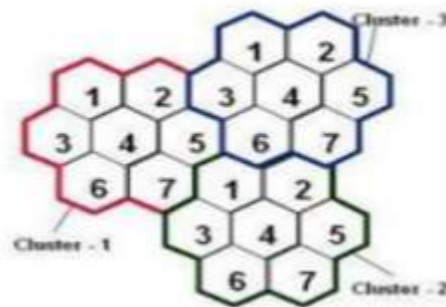
Function of power output detector: The power detector estimates the signal power, if the signal is found offset of estimate value it is given to automatic power control unit to match the estimation.

b) Design the frequency reuse pattern for cluster size $N=7$, $N=12$

6M

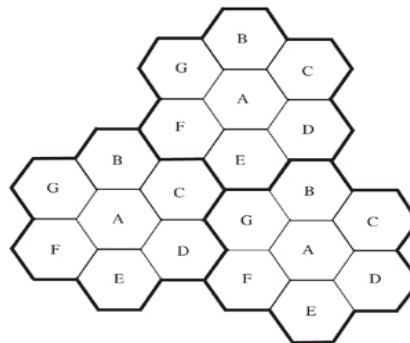
Ans

frequency reuse pattern with cluster size 7

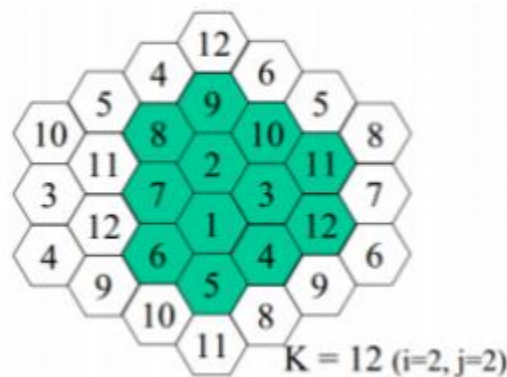


OR

Frequency reuse pattern with cluster size 7



Frequency reuse pattern with cluster size 12



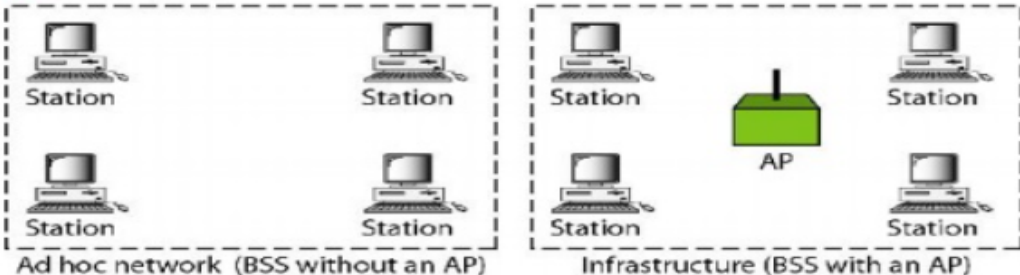
3M each
for Parten



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c)	<p>Explain the architecture of WLAN technology with the help of its diagram.</p>	<p>6M</p>
<p>Ans</p>	<p>Architecture of WLAN:</p>  <p>WLAN system architecture defines two types of services;</p> <ol style="list-style-type: none"> 1) Basic service set (BSS) 2) Extended service set (ESS) <ul style="list-style-type: none"> ● BSS is the basic building block of wireless LAN. ● BSS consist of stationary or moving wireless stations and central base station called Access point “AP”. Thus BSS can be either with AP or without AP ● The BSS without AP can not send data to another BSS. So no data exchange can take place outside that BSS hence it is known as Standalone network or ADHOC BSS. ● However all the stations inside the BSS can exchange data among themselves. ● The BSS with AP can communicate to other BSS via AP thus BSS with AP is called as Infrastructure BSS ● The ESS consist of multiple BSS with AP. The BSS’s in this system are connected to each other via Distribution system or wired LAN. ● The AP’s are connected to each other via Distribution system as shown in figure. The distribution system can be any type of LAN such as Ethernet. ● The ESS consist of two types of stations: the mobile stations which can move and change their location & stationary or non-moving stations. Out of this non-moving stations are the AP which are part of wired LAN. Whereas mobile stations are the part of BSS. ● The BSS are connected to each other to form a network called infrastructure network. In such network stations are closed to each other can communicate without taking help 	<p>Diagram 3M</p> <p>Explanation 3M</p>

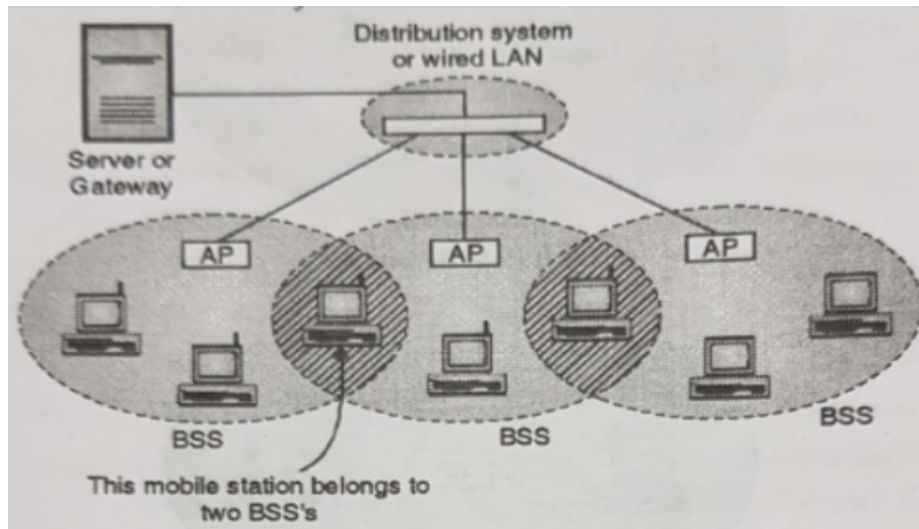


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of AP. But if two stations located in two different BSS without wish to communicate with each other they can communicate through AP's



Q.6 Attempt any Two of the following.

12M

a) Explain the function of home location register, Visitors location register and operation and maintenance system in GSM architecture with the help of block diagram.

6M

Ans GSM architecture:

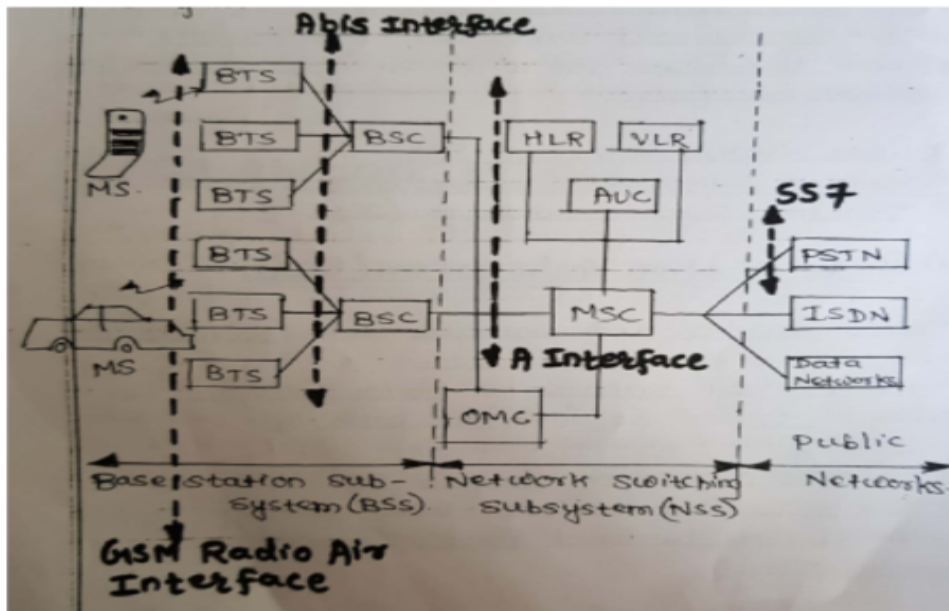


Diagram 3M



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Home location register:

- The HLR represents a centralized database that has the permanent data fill about the mobile subscribers who resides in the same city as the MSC in a large service area (Generally one per GSM network operator).
- It is referenced using the SS7 signaling capabilities for every incoming call to the GSM network for determining the current location of the subscriber [i.e., for obtaining the mobile station routing number (MSRN) so that the call may be routed to the mobile Station's serving MSC].
- The HLR is kept updated with the current locations of all its mobile subscribers, including those who may have roamed to another Network operator within or outside the country.
- The routing information is obtained from the serving VLR on a call-by-call basis so that for each incoming call the HLR queries the Serving VLR for an MSRN. Usually, one HLR is deployed for each GSM network for administration of Subscriber configuration and service.
- Besides the up-to-date location information for each subscriber, which is dynamic, the HLR maintains the following subscriber data on a permanent basis:
 - 1) International mobile subscriber identity (IMSI)
 - 2) Service subscription information service restrictions
 - 3) supplementary services (subscribed to)
 - 4) mobile terminal characteristics
 - 5) billing/accounting information

Visitor location register:

- The VLR represents a temporary data store, and generally there is one VLR per MSC.
- This register contains information about the mobile subscribers who are currently in the service area covered by the MSC/VLR.
- The VLR also contains information about locally activated features such as call forward on busy. Thus the temporary subscriber information resident in a VLR includes:
 - 1) Features currently activated
 - 2) Temporary mobile station identity (TMSI)
 - 3) Current location information about the MS (e.g., location area
 - 4) and cell identities)

Operation and maintenance system / Centre (OMS/OMC):

- OMC has connection with MSC and all BSCs.
- It helps in troubleshooting the faults and optimizing the performance of the network.
- Operation Maintenance Center (OMC) is used to monitor and maintain the performance of each Mobile Station (MS), Base Station (BS), Base Station Controller (BSC) and Mobile Switching Center (MSC) within a GSM system. The OMC has three main functions which are:
 - 1) To maintain all telecommunications hardware and network operations with a particular market.
 - 2) Manage all charging and billing procedures.
 - 3) Manage all mobile equipment in the system.

**Expainati
on 3M**



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b)	<p>i) Name the block diagram shown in figure No.3</p> <p>ii) Identify the block “A” and “B” in the given block diagram.</p> <p>iii) State the functions block “A” and “B”</p>	6M
Ans	<p>i. The block diagram shown in figure No. 3 of “UMTS architecture”</p> <p>ii. Block “A” : GMSC(Gateway MSC) & Block “B” : SGSN(Serving GPRS Support Node)</p> <div style="text-align: center;"> <p>The diagram illustrates the UMTS Network Architecture. At the top, it shows connections to 'To Public Networks ..' which includes 'PSTN' and 'Internet'. Below this is the 'UMTS Core Network' (indicated by a dashed box). Inside the core network, there are several blocks: 'GMSC' (labeled as Block 'A'), 'AUC', 'HLR', 'GGSN', 'MSC', 'EIR', and 'SGSN' (labeled as Block 'B'). 'GMSC' is connected to 'PSTN' and 'Internet'. 'GGSN' is connected to 'Internet'. 'HLR' is connected to 'AUC', 'GMSC', 'MSC', and 'SGSN'. 'EIR' is connected to 'HLR', 'MSC', and 'SGSN'. 'MSC' is connected to 'GMSC', 'HLR', 'EIR', and three 'RNS' blocks. 'SGSN' is connected to 'HLR', 'EIR', and the three 'RNS' blocks. The three 'RNS' blocks are connected to each other and to the core network, with dashed arrows indicating external connections.</p> </div> <p>iii. Function of Block “A” [Gateway MSC (GMSC)]: This is effectively the interface to the external networks.</p> <p>iv. Function of Block “B” [SGSN(Serving GPRS Support Node)]</p> <p>The SGSN provides a number of functions within the UMTS network architecture.</p> <p>Mobility management (MM): When a UE attaches to the Packet Switched domain of the UMTS Core Network, the SGSN generates MM information based on the mobile's current location.</p> <p>Session management: The SGSN manages the data sessions providing the required quality of service and also managing what are termed the PDP (Packet data Protocol) contexts, i.e. the pipes over which the data is sent.</p> <p>Interaction with other areas of the network: The SGSN is able to manage its elements within the network only by communicating with other areas of the network, e.g. MSC and other circuit switched areas.</p> <p>Billing: The SGSN is also responsible billing. It achieves this by monitoring the flow of user data across the GPRS network. CDRs (Call Detail Records) are generated by</p>	<p>1M</p> <p>2M</p> <p>1.5M each</p>

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the SGSN before being transferred to the charging entities (Charging Gateway Function, CGF).

c) Explain the function of cellular system with the help of diagram.

6M

Ans

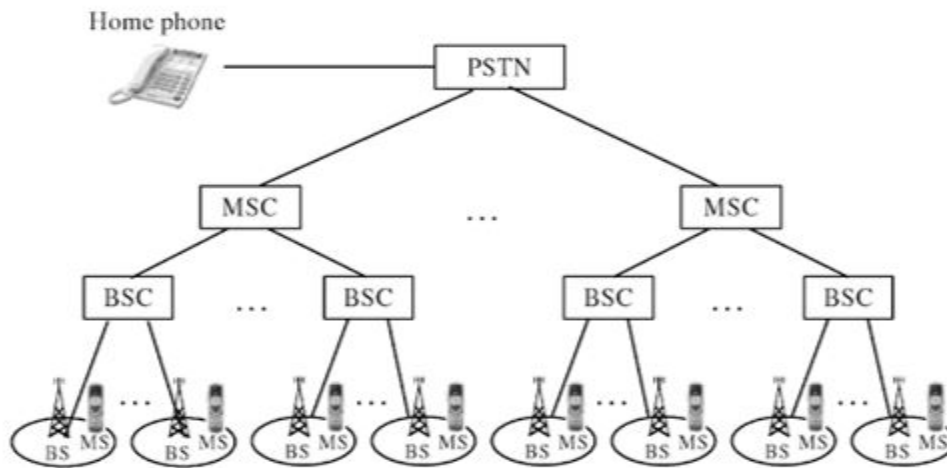
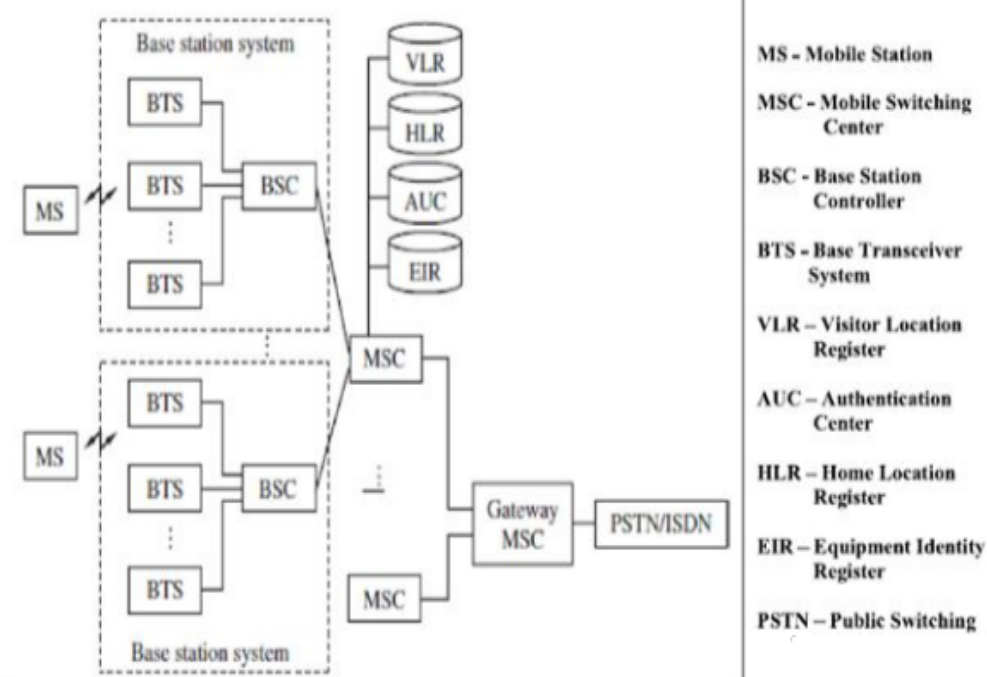


Fig: cellular system infrastructure

OR



**Diagram
3M,
Explanati
on 3M**



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Explanation:

- Early wireless systems had a high-power transmitter, covering the entire service area. This required a very huge amount of power and was not suitable for many practical reasons.
- The cellular system replaced a large zone with a number of smaller hexagonal cells with a single BS (base station) covering a fraction of the area.
- Evolution of such a cellular system is shown in the above figures, with all wireless receivers located in a cell being served by a BS.
- In a cellular structure, a MS (mobile station) needs to communicate with the BS of the cell where the MS is currently located and the BS acts as a gateway to the rest of the world. Therefore, to provide a link, the MS needs to be in the area of one of the cells (and hence a BS) so that mobility of the MS can be supported. Several base stations are connected through hard-wires and are controlled by a BS controller (BSC), which in turn is connected to a mobile switching center (MSC).
- Several mobile switching centers are interconnected to a PSTN (public switched telephone network) and the ATM (asynchronous transfer mode) backbone. To provide a better perspective of wireless communication technology, simplified system infrastructure for cellular system is shown in the above figure.