SUMMER – 2022 EXAMINATION
MODEL ANSWER

Subject: Wireless & Mobile Network **Subject Code:** **22622**

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
1.	**a)**	**Attempt any FIVE of the following:** **Define the term** **i) Routing area.** **ii) Location area**	**10** **2M**
	Ans.	i) Routing Area: The routing area is the packet-switched domain equivalent of the location area. A "routing area" is normally a subdivision of a "location area". Routing areas are used by mobiles which are GPRS-attached . ii) Location Area: A "location area" is a set of base stations that are grouped together to optimize signaling.	***1M for each definition***

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	b) **Ans.**	**State the processes involved in the use of RFID in student attendance in a college.** Wireless data capture and Transaction are processes involved in the use of RFID in student attendance in college.	**2M** ***2M for naming correct processes***
	c) **Ans.**	**State two features of 5G technology.** • Up to 10Gbps data rate - > 10 to 100x speed improvement over 4G and 4.5G networks • 1-millisecond latency • Packet switching • CDMA multiplexing • Up to 100x number of connected devices per unit area (compared with 4G LTE) • 99.999% availability • 100% coverage • 90% reduction in network energy usage • Up to 10-year battery life for low power IoT device	**2M** ***1M each Any 2 features***
	d) **Ans.**	**Classify Clustering algorithm.** i. Distributed Clustering Algorithm ii. CentralizedClustering Algorithms	**2M** ***1M each***
	e) **Ans.**	**Define the term LEC (Local Exchange Carrier)** Local Exchange Carrier (LEC) is a local telecom Exchange that provides telecommunication services within the area and operates within a local area.	**2M** ***2M for Correct definition***
	f) **Ans.**	**State two applications of MANET.** • **PAN and Bluetooth**: A PAN is localized and tiny range network whose devices are generally belong to a specified individual. Limited-range MANET such as Bluetooth can make simpler the exchange among several portable devices like a laptop, and a cell phone. • **Business Sector**: Ad-hoc network could be used for rescuing and emergency processes for adversity assistance struggles, for instance, in flood, fire or earthquake. Emergency saving procedures should take place where damaged and non-existing	**2M** ***1M each Any 2 applications***

		transmissions structure and quick preparation of a transmission network is required. • **Sensor Networks**: managing home appliances with MANETs in both the case like nearby and distantly. Tracking of objects like creatures. Weather sensing related activities. • **Backup Services**: liberation operations, tragedy recovery, diagnosis or status or record handing in hospitals, replacement of stationary infrastructure. • **Educational sector**: arrangement of communications facilities for computer-generated conference rooms or classrooms or laboratories. • **Military field**: Ad-Hoc networking can permit army to exploit benefit of conventional network expertise for preserving any info network among vehicles, armed forces, and headquarters of information. • **Cooperative work**: To facilitate the commercial settings, necessity for concerted computing is very significant external to office atmosphere and surroundings as compared to inner environment. People want getting outside meetings for exchanging the information plus cooperating with each other regarding any assigned task. • **Confined level**: Ad-Hoc networks are able to freely associate with immediate, in addition momentary hypermedia network by means of laptop computers for sharing the info with all the contestants' e.g. classroom and conference. Additional valid and confined level application may be in domestic network where these devices can interconnect straight in exchanging the information. **(Any other Relevant Application can be considered)**	

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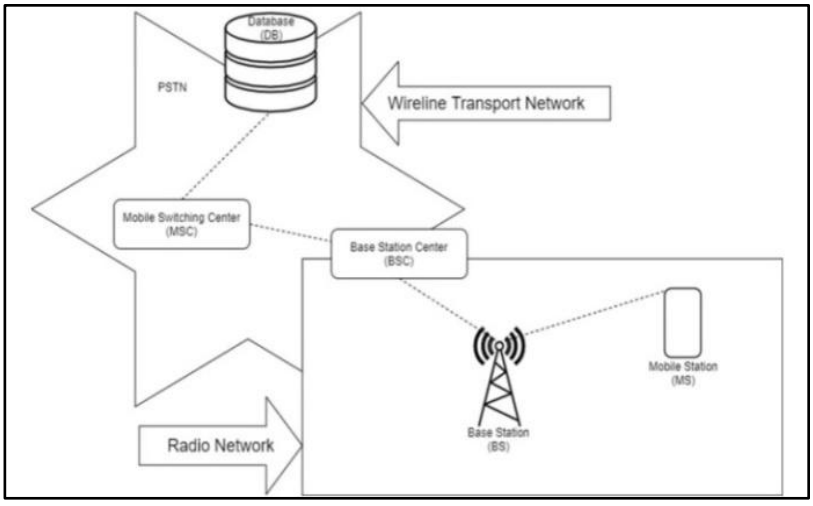
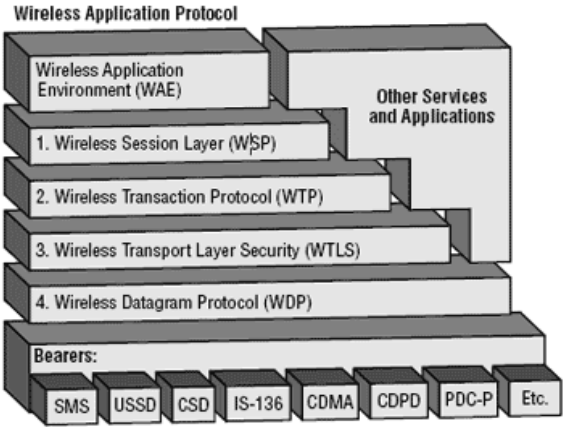
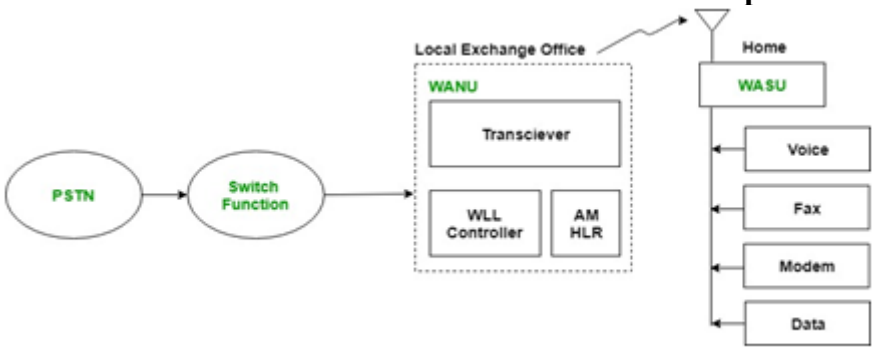
	g) Ans.	**State two specifications of IMT 2000.** • Frequency 2000MHz region • Target user data rate 2000 kbps • 144kbps absolute minimum acceptable transmission data rate • 384 kbps the ideal achievable data rate • 2000 kbps data rate while operating mobile phone inside building for stationary user. • Symmetrical and asymmetrical Data transmission • High data rates for indoor and outdoor operations • Roaming between different operational environments	**2M** ***1M each*** ***Any two specifications***

2.	**a) Ans.**	**Attempt any <u>THREE</u> of the following:**
		Draw the block diagram of the architecture of PCS (Personal Communication Services) and explain.
		 
		
		• The PCS Network Architecture is a communication network structure in which components communicate with one another to establish wireless communication.
		• The PCS Network Architecture is divided into two sections:
		  • Wireline Transport Network
		  • Radio Network
			12
			4M
			2M for Block Diagram
			2M for explanation

		Radio Network: • The radio network connects Mobile Stations (MS) and other network components via a wireless network. • MS connect with one another via the radio network's Base Stations (BS). • The radio link protocols are handled by the BS in a radio network during communication. • The BSC serves as a link between the radio network's BTS and the Wireline Transport network's MSC **Wireline Transport Network:** • The Base Station Controller (BSC) in the Radio Network interfaces with the Mobile Switching Center (MSC) in the Wireline Transport Network. • To provide wireline customers with communication services, MSC connects to the Public Switch Telephone Network (PSTN). • MSC also communicates with a mobility database, which keeps track of where moving devices are in the architecture.	
	b) Ans.	**Explain the functions performed by GPRS support nodes.** There are TWO Support nodes in GPRS: • **Serving GPRS Support Node (SGSN)** • **Gateway GPRS Support Nodes (GGSN)** • **Serving GPRS Support Node (SGSN)** The Serving GPRS Support Node is responsible for authentication of GPRS mobiles, registration of mobiles in the network, mobility management, and collecting information on charging for the use of the air interface • **Gateway GPRS Support Node (GGSN)** The Gateway GPRS Support Node acts as an interface and a router to external networks. It contains routing information for GPRS mobiles, which is used to tunnel packets through the IP based internal backbone to the correct Serving GPRS Support Node. The GGSN also collects charging information connected to the use of the external data networks and can act as a packet filter for incoming traffic.	**4M** ***2M for each node***

	c) **Ans.**	**Draw the WAP protocol stack and state the functions of any four protocols.**  **1. Wireless Datagram Protocol (WDP):** The WDP allows WAP to be bearer-independent by adapting the transport layer of the underlying bearer. The WDP presents a consistent data format to the higher layers of the WAP protocol stack, thereby offering the advantage of bearer independence to application developers. **2.Wireless Transport layer Security(WTLS)** WTLS incorporates security features that are based upon the established Transport Layer Security (TLS) protocol standard. It includes data integrity checks, privacy, service denial, and authentication services. **3.Wireless Transaction Protocol:** The WTP runs on top of a datagram service, such as User Datagram Protocol (UDP) and is part of the standard suite of TCP/IP protocols used to provide a simplified protocol suitable for low bandwidth wireless stations. **4. Wireless Session Protocol:** Unlike HTTP, WSP has been designed by the WAP Forum to provide fast connection suspension and reconnection. **5. Wireless Application Environment (WAE).** This layer is of most interest to content developers because it contains among other things, device specifications, and the content development programming languages, WML, and WMLScript.	**4M** ***1M for each protocol*** ***Any four protocols***

	d) Ans.	**Draw the block schematic of WLL architecture and explain.**  WLL stands for Wireless Local Loop. Microwave wireless linkcan be used to create a wireless local loop such as shown in figure. The components are • **PSTN:** It is Public Switched Telephone Network which is a circuit switched network. It is a collection of world's interconnected circuit switched telephone networks. • **Switch Function:** Switch Function switches the PSTN among various WANUs. • **WANU:** It is short for Wireless Access Network Unit. It is present at the local exchange office. All local WASUs are connected to it. Its functions includes: Authentication, Operation & maintenance, Routing, Transceiving voice and data. It consists of following sub-components: i. Transceiver: It transmits/receives data. ii. WLL Controller: It controls the wireless local loop component with WASU. iii. AM: It is short for Access Manager. It is responsible for authentication. iv. HLR: It is short for Home Location Register. It stores the details of all local WASUs. • **WASU:** It is short for Wireless Access Subscriber Units. It is present at the house of the subscriber. It connects the subscriber to WANU and the power supply for it is provided locally.	**4M** ***2M for Block Diagram*** ***2M for explanation***

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3. a) Attempt any THREE of the following: **12**

Compare the features of 3G and 4G. **4M**

1M each for any relevant feature

Ans.

Parameters	3G Technology	4G Technology
Full Form	The term 3G is an abbreviation for the third generation technology.	The term 4G is an abbreviation for the fourth generation technology.
Maximum Upload Rate	It can go up to 5 Megabytes per second.	It can go much higher, about 500 Megabytes per second.
Maximum Rate of Download	The 3G technology offers a maximum download rate of about 21 Megabytes per second.	The 4G technology can download videos at a much faster rate, which can go as high as 1 Gigabyte per second.
Switching Techniques	It utilizes the packet switching technique.	It utilizes both the message switching as well as the packet switching techniques.
Range of Frequency	The frequency of the 3G technology ranges somewhat between 1.8 to 2.5 Gigahertz.	The frequency range of the 4G technology ranges somewhat between 2 to 8 Gigahertz.
Leniency	The 3G technology is horizontally lenient.	The 4G technology is both vertically as well as horizontally lenient.
Network Architecture	The network architecture of the 3G technology is a wide area cell-based one.	The network architecture of the 4G technology is cell-based for a wide area along with the integration of WLAN.
Error Correction	The 3G technology performs error correction using the turbo codes.	The 4G technology performs error correction using the concatenated codes.

b) Explain the Quality of service parameters of GPRS. **4M**

1M for each point

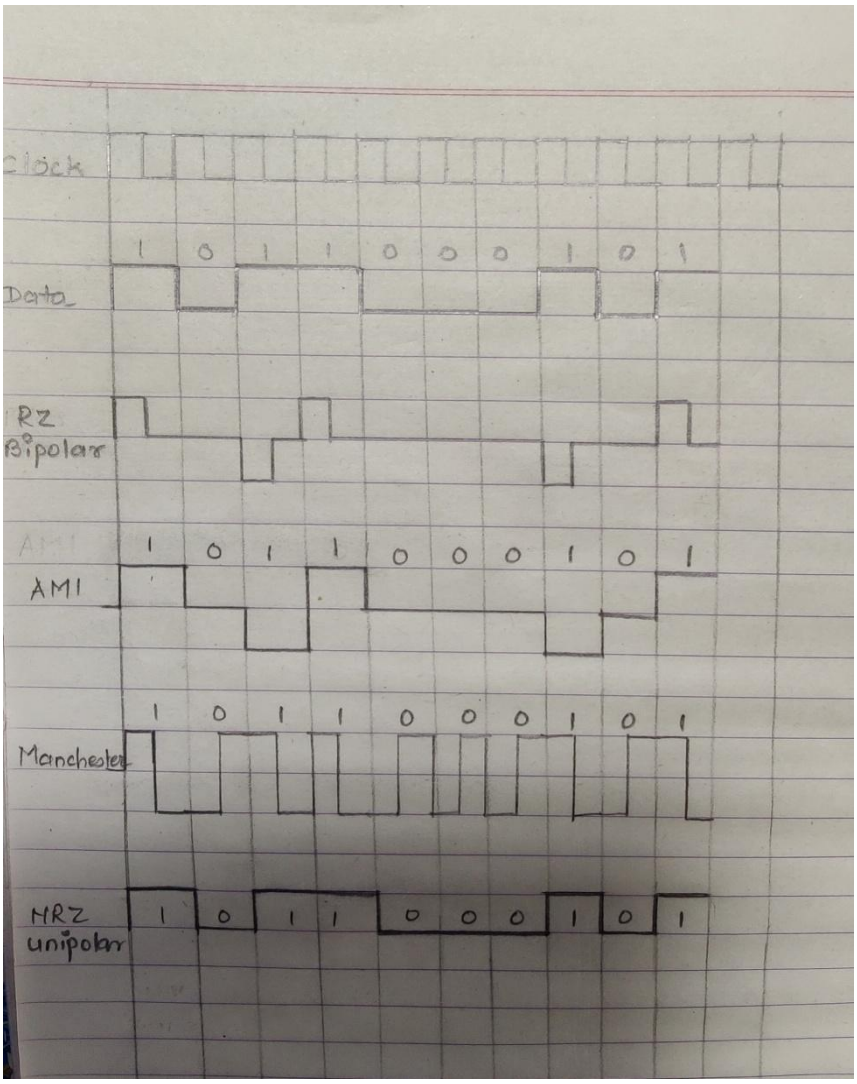
Ans.

The QoS is a vital feature of GPRS services as there are different QoS support requirements for assorted GPRS applications like realtime multimedia, web browsing, and e-mail transfer.

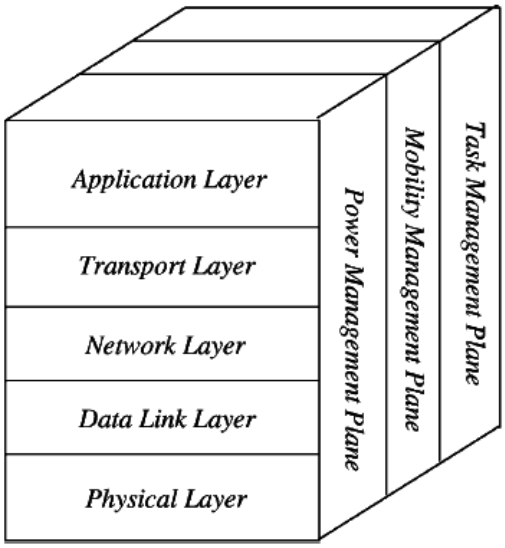
GPRS allows defining QoS profiles using the following parameters :

- Service Precedence
- Reliability
- Delay and
- Throughput

		These parameters are described below: **Service Precedence** The preference given to a service when compared to another service is known as **Service Precedence**.This level of priority is classified into three levels called: • high • normal • low When there is network congestion, the packets of low priority are discarded as compared to high or normal priority packets. **Reliability** This parameter signifies the transmission characteristics required by an application.The reliability classes are defined which guarantee certain maximum values for the probability of loss, duplication, mis-sequencing, and corruption of packets. **Delay** The delay is defined as the end-to-end transfer time between two communicating mobile stations or between a mobile station and the GI interface to an external packet data network. This includes all delays within the GPRS network, e.g., the delay for request and assignment of radio resources and the transit delay in the GPRS backbone network. Transfer delays outside the GPRS network, e.g., in external transit networks, are not taken into account. Throughput The throughput specifies the maximum/peak bit rate and the mean bit rate. Using these QoS classes, QoS profiles can be negotiated between the mobile user and the network for each session, depending on the QoS demand and the available resources.	
	c)	**Encode the datastream 1011000101 using the following techniques** **i) RZ Bipolar** **ii) AMI** **iii) Manchester** **iv) NRZ-unipolar**	**4M**

	Ans.		***1M for each technique***
	d) Ans.	**Draw the architecture of WSN and explain.** There are 2 types of architecture used in WSN: **1. Layered Network Architecture:**Layered Network Architecture makes use of a few hundred sensor nodes and a single powerful base station. Network nodes are organized into concentric Layers. It consists of 5 layers and three crosslayers.	**4M** ***2M for diagram***

		The 5 layers are: 1. **Application** -Responsible for traffic management and provide software for differentapplicationsthat translate the data in an understandable form orsendqueriesto obtaincertain information 2**. Transport Layer**-Layer-The function of thislayer is to provide reliability and congestionavoidance where a lot of protocols designed to provide thisfunction are either appliedon the upstream or downstream. 3**. Network Layer**-The major function of thislayer is routing,handling the major challengesare in the powersaving, limited memory and buffers,sensor does not have a global IDand have to be self organized. The basic idea of the routing protocol isto define a reliable path and redundant paths. 4**. Data Link Layer**-Responsible for multiplexing data streams, data frame detection, MAC, and error control, ensure reliability ofPoint–point or point– multipoint. Errors or unreliability comesfrom. 5**. Physical Layer** -Responsible for frequency selection, carrier frequency generation,signal detection, Modulation and data encryption The cross layers : These layers are used to manage the network and make the sensors work together in order to increase the overall efficiency of the network	***2M for explanation*** ***Any one architecture can be explained by students***



Three functions are-
1.Power Management Plane
2.Mobility Management Plane-detect sensor nodes movement. Node can keep track of neighbors and power levels (for power balancing)
3.Task Management Plane-schedule the sensing tasks to a given area. Determine which nodes are off and which ones are on.

2. Clustered Network Architecture:

• In Clustered Network Architecture, Sensor Nodes autonomously clubs into groups called clusters. It isbased on the Leach Protocol which makes use of clusters. Leach Protocol stands for Low Energy AdaptiveClustering Hierarchy.

Properties of Leach Protocol:

• It is a 2-tier hierarchy clustering architecture.

• It is a distributed algorithm for organizing the sensor nodes into groups called clusters.

• The cluster head nodes in each of the autonomously formed clusters create the Time-division multiple access
(TDMA) schedules.

• It makes use of the concept called Data Fusion which makes it energy efficient.

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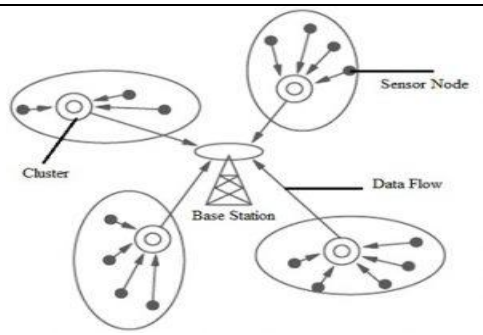
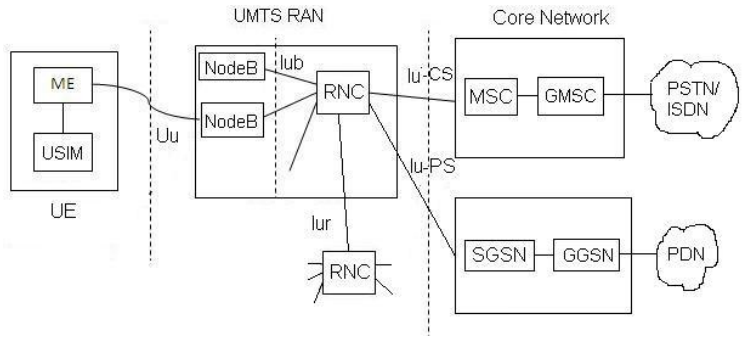
			
4.	**a) Ans.**	**Attempt any THREE of the following:** **Draw the architecture of UMTS and explain**  UMTS system uses the same core network as the GPRS and uses entirely new radio interface. • The new radio network in UMTS is called UTRAN (UMTS Terrestrial Radio Access Network) and is connected to the core network (CN) of GPRS via Iu interface. • The Iu is the UTRAN interface between the Radio network controller RNC and CN. • The mobile terminal in UMTS is called User Equipment (UE). The UE is connected to Node-B over high speed Uu (up to 2 Mbps) Interface. The Node-B are the equivalent of BTS in GSM and typically serve a cell site. Several Node-Bs are controlled by a single RNCs over the Iub interface. • The RNCs are connected to CN through Iu interface. • The packet switched data is transmitted through Iu-PS interface and circuit switched data is transferred over Iu-CS interface. One of the new interfaces in UTRAN is Iur interface which connects two RNCs and has no equivalent in GSM system. The Iur interface facilitates handling of 100 percent of RRM (Radio Resource	**12** **4M** ***2M for any relevant diagram*** ***2M for explanation***

Management) and eliminates the burden from CN.

- UMTS also supports GSM mode connections in which case the MS connect to the CN through Um interface to BSS and BSS connects through A (Gb interface in GPRS) interface to CN.

b) **Compare GSM networks with GPRS networks** **4M**

Ans. ***1M for each relevant point***

GSM	GPRS
GSM represents Global Systems for Mobile Communications.	GPRS represents General Packet Radio Service.
It is 2G	It is 2.5 G
The frequency bands used in the GSM system are 900 and 1800 MHz.	The frequency bands used in the system are 850, 900, 1800 and 1900 MHZ.
GSM is used in circuit switching traffic.	GPRS is used for packet switching traffic.
GSM is used in almost all countries and remote locations. Therefore, GSM supports its service to the users.	GPRS services cannot be provided in all the countries and remote locations. This creates GPRS confined to developed areas with a suitable network connection.
Internet service is not supported in GSM and this creates communication harder in the system. Communication has to be completed through messages or calls.	Internet services are supported in GPRS and this is completed with wireless systems. Therefore the internet can be used even in remote locations and communication is completed through emails or other messaging services with the internet.

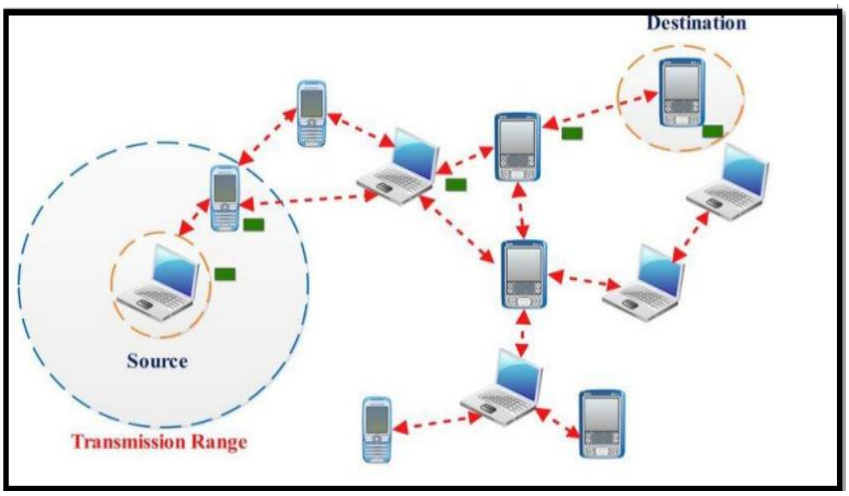
	c) **Ans.**	**Explain the energy constraints in sensor nodes in WSN and name the protocols to design energy efficiency in WSN** Energy constraints in sensor nodes inWSN: Wireless sensor node is microelectronic device meansit is equipped with a limited number of power source. Nodes are dependent onbattery for their power. Hence power conservation and power management isan important issue in wireless sensor network. Due to this reason researchersare focusing on the design of power aware protocols and algorithm forsensors network. Protocol used: Hierarchal routing protocols are considered more energy efficient when compared with flat and location based routing protocols. A number of hierarchal based energy efficient routing protocols have been referred to in the literature review such as LEACH , TEEN and APTEEN , PEGASIS , MECN and SMECN , SOP , HPAR , VGA , Sensor Aggregate , TTDD , Energy Efficient Self-Healing , Energy Efficient Position Based , and CELRP .	**4M** ***2M for constraints*** ***2M for relevant protocol***
	d) **Ans.**	**Explain the logical channels in a GPRS system in short.** There is a variety of channels used within GPRS, and they can be set into groups dependent upon whether they are for common or dedicated use.The system does use the GSM control and broadcast channels for initial set up, but all the GPRS actions are carried out within the GPRS logical channels carried within the PDCH **Broadcast channels:** • ***Packet Broadcast Central Channel (PBCCH):*** • This is a downlink only channel that is used to broadcast information to mobiles and informs them of incoming calls etc. • It is very similar in operation to the BCCH used for GSM. • In fact the BCCH is still required in the initial to provide a time slot number for the PBCCH. • In operation the PBCCH broadcasts general information such as power control parameters, access methods and operational modes, network parameters, etc, required to set up calls.	**4M** ***4M for correct explanation***

Common control channels:

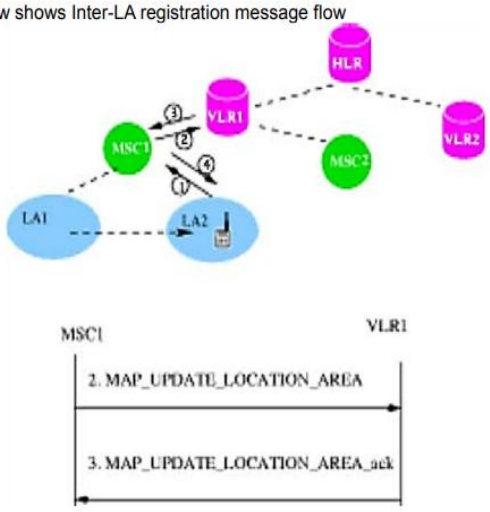
- **Packet Paging Channel (PPCH):** This is a downlink only channel and is used to alert the mobile to an incoming call and to alert it to be ready to receive data. It is used for control signaling prior to the call set up. Once the call is in progress a dedicated channel referred to as the PACCH takes over.
- **Packet Access Grant Channel (PAGCH):** This is also a downlink channel and it sends information telling the mobile which traffic channel has been assigned to it. It occurs after the PPCH has informed the mobile that there is an incoming call.
- **Packet Notification Channel (PNCH):** This is another downlink only channel that is used to alert mobiles that there is broadcast traffic intended for a large number of mobiles. It is typically used in what is termed point-to-point multicasting.
- **Packet Random Access Channel (PRACH):** This is an uplink channel that enables the mobile to initiate a burst of data in the uplink. There are two types of PRACH burst, one is an 8 bit standard burst, and a second one using an 11 bit burst has added data to allow for priority setting. Both types of burst allow for timing advance setting.

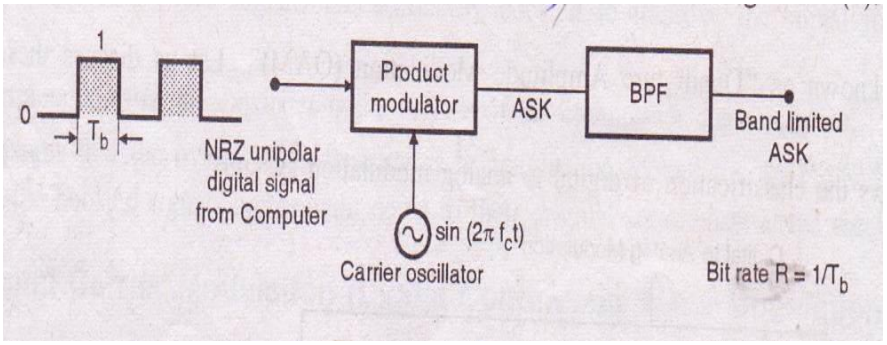
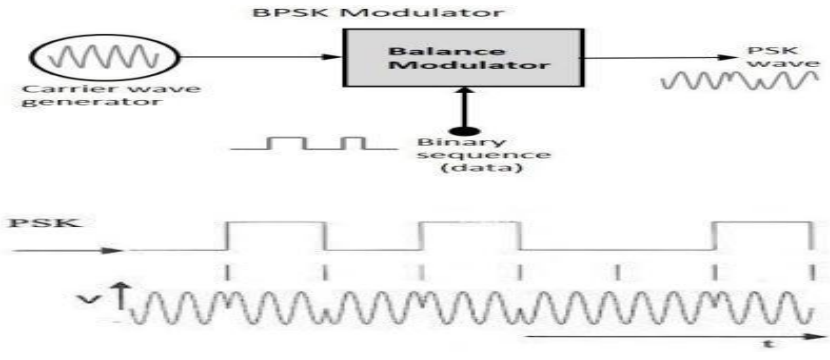
Dedicated control channels:

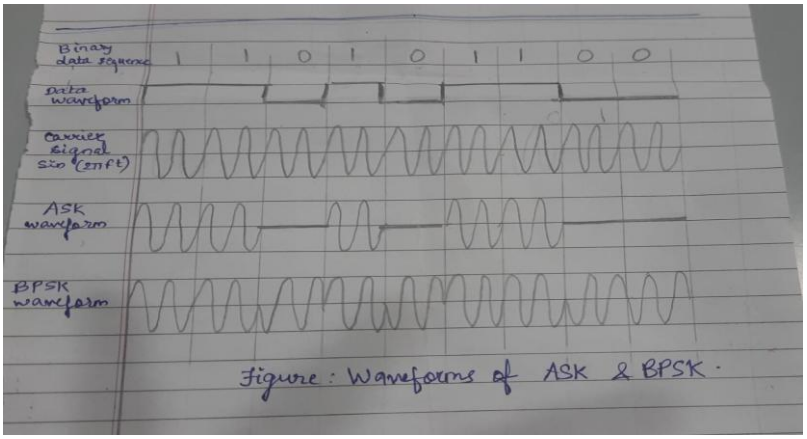
- **Packet Associated Control Channel (PACCH):** : This channel is present in both uplink and downlink directions and it is used for control signaling while a call is in progress. It takes over from the PPCH once the call is set up and it carries information such as channel assignments, power control messages and acknowledgements of received data.
- **Packet Timing Advance Common Control Channel (PTCCH):** This channel, which is present in both the uplink and downlink directions is used to adjust the timing advance. This is required to ensure that messages arrive at the correct time at the base station regardless of the distance of the mobile from the base station. As timing is critical in a TDMA system and signals take a small but finite time to travel this aspect is very important if long guard bands are not to be left.

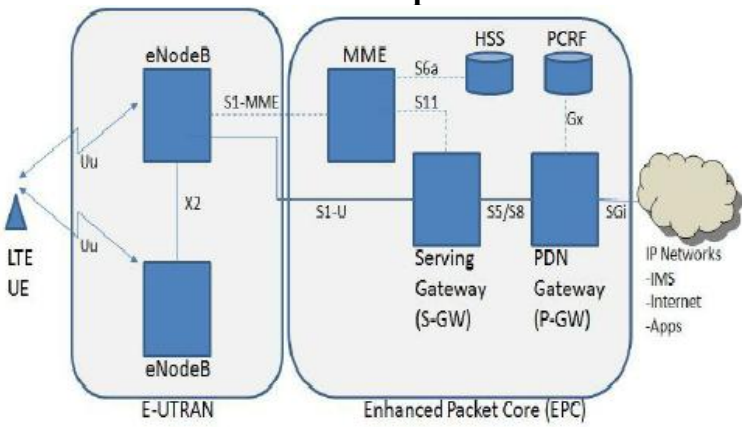
		Dedicated traffic channel: • **Packet Data Traffic Channel (PDTCH):** This channel is used to send the traffic and it is present in both the uplink and downlink directions. Up to eight PDTCHs can be allocated to a mobile to provide high speed data.	
	e) **Ans.**	**Draw the MANET Topology and explain. State two applications of MANET.** Topology in MANET MANET may operate as standalone fashion or they can be the part of larger internet. They form highly dynamic autonomous topology with the presence of one or multiple different transceivers between nodes. Autonomous Behavior: Each node can act as a host and router, which shows its autonomous behavior. Typically communicate at radio frequencies (30MHz-5GHz) • TORA is a routing algorithm and is mainly used in MANETs to enhance scalability TORA is an adaptive routing protocol. It is therefore used in multi-hop networks.  	**4M** ***2M for Topology*** ***2M for applications***

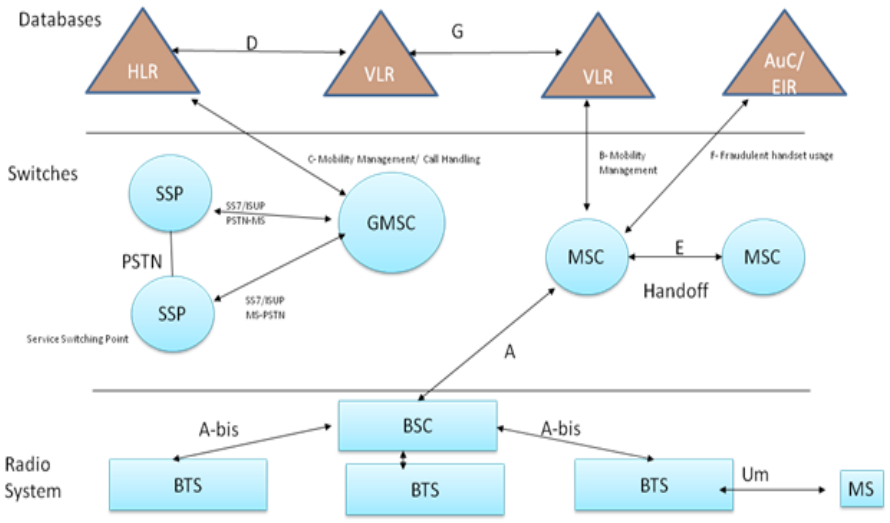
		Applications of MANET • Defense applications: Many defense applications require on the fly communications set-up, and adHoc/sensor networks are excellent candidates for use in battlefield management. • Crisis management applications: These arise, for example, as a result of natural disasters in which theentire communication infrastructure is in disarray. Restoring communications quickly is essential. • Telemedicine: The paramedic assisting the victim of a traffic accident in a remote location must accessmedical records (e.g. X-rays) and may need video conference assistance from a surgeon for an emergencyintervention. In fact, the paramedic may need to instantaneously relay back to the hospital the victim's X-rays and other diagnostic tests from the site of the accident. • Tele- Geoprocessing application: The combination of GPS, GIS (Geographical Information Systems), andhigh-capacity wireless mobile systems enables a new type of application referred to as tele-geoprocessing WSN • Virtual Navigation: A remote database contains the graphical representation of building, streets, andphysical characteristics of a large metropolis. They may also "virtually" see the internal layout of buildings,including an emergency rescue plan, or find possible points of interest. • For example, A VANET (Vehicular Ad Hoc Network), is a type of MANET that allows vehicles tocommunicate with roadside equipment.	
5.	**a)** **Ans.**	**Attempt any <u>TWO</u> of the following:** **Explain location update procedure for a inter LA Movement in GSM with suitable diagram** **Inter LA movement in GSM** **Step 1:** ▸ The MS moves from LA1 to LA2, where both LAs are connected to the same MSC ▸ A location update request message is sent from the MS to the MSC through the BTS, include the address of the previously visited LA, MSC, and VLR and TMSI is used to avoid sending the IMSI on the radio path	**12** **6M** ***4M for explanation***

		Step 2:The MSC forwards the location update request to the VLR by a TCAP message(TRANSACTION CAPABILITY APPLICATION PART) message, MAP_UPDATE_LOCATION_AREA , ▸ Address of the MSC , ▸ TMSI of the MS , ▸ Previous location area identification (LAI) ▸ Target LAI **Step 3 and Step 4**: MSC updates the LAI field of the VLR record, and replies with an acknowledgment to the MS through the MSC • Fig. below shows Inter-LA registration message flow 	***2M for diagram***
	b) **Ans.**	**Explain the principle of working of ASK and BPSK with suitable waveforms for the bit sequence 110101100** ASK Block Diagram	**6M**

			***2M for diagram***
		• The carrier is a sinewave of frequency . • The digital signal from the computer acts as the modulating signal • The ASK modulator is nothing but a multiplier followed by a band pass filter. • Due to the multiplication, the ASK output will be present only when a binary "1" is to be transmitted • The ASK output corresponding to a binary "0" is zero. • The carrier is transmitted when a binary 1 is to be sent and no carrier is transmitted when a binary 0 is to be sent. <u>PSK Block Diagram</u> 	***4M for explanation***

		• Phase-shift keying (PSK) is a digital to analog modulation scheme based on changing, or modulating, the initial phase of a carrier signal. • PSK is used to represent digital information, such as binary digits zero (0) and one (1).The modulation of PSK is done using a balance modulator, which multiplies the two signals applied at the input. • For a zero binary input, the phase will be 180° and for a high input, the phase reversal is of 0° • Following is the diagrammatic representation of PSK Modulated output wave along with its given input. • The output sine wave of the modulator will be the direct input carrier or the inverted (180° phase shifted) input carrier, which is a function of the data signal. • Amplitude and frequency of the original carrier signal is kept constant.  Figure : Waveforms of ASK & BPSK.	

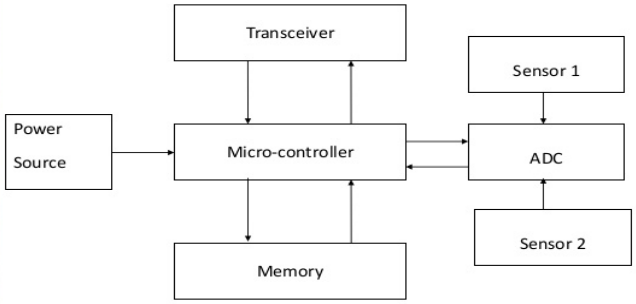
	c) Ans.	**Draw the architecture of 4G and explain.**  **Figure: 4G network architecture** 4G network is an integration of all heterogeneous wireless access networks such as Ad-hoc, cellular, hotspot and satellite radio component. Technologies used in 4G are smart antennas for multiple input and multiple output (MIMO), IPv6,VoIP, OFDM and Software Defined Radio (SDR) System. **Smart Antennas:** Smart Antennas are Transmitting and receiving antennas. It does not require increase power and additional frequency. **IPV6 Technology:** 4G uses IPV6 Technology in order to support a large number of wireless enable devices. It enables a number of application with better multicast, security and route optimization capabilities. **VoIP:** It stands for Voice over IP. It allows only packet to be transferred eliminating complexity of 2 protocols over the same circuit. **OFDM** OFDM stands for Orthogonal Frequency Division Multiplexing.It is currently used as WiMax and WiFi.	**6M** ***2M for diagram*** ***4M for explanation***

		SDR: SDR stands for Software Defined Radio.It is the form of open wireless architecture. **MME- Mobility Management Entity:** It is used for Paging, Authentication, Handover and Selection of Serving Gateway **SGW-Serving Gateway:** It is used to Routing and Forwarding user data packet. **PDN-GW Packet Data Network Gateway:** It is used for User Equipment (UE) IP allocation. **HSS-Home Subscriber Server:** It is a user Database used for service subscriber, user identification and addressing **PCRF-Policy and Charging Rule Function:** It provide quality of service and charging **eNode B-evolved Node B:** It is used as radio resources management and radio bearer control.	
6.	**a)** **Ans.**	**Attempt any <u>TWO</u> of the following:** **Explain the Network signaling and radio interfaces in GSM.**  	**12** **6M** ***2M for diagram***

		GSM Network Signaling: • The figure shows various network signaling protocols used by the entity interfaces in GSM • The software platform for implementing GSM network signaling protocol is GSM MAP(Mobile Application Part) • GSM MAP is used in B,C,D,E,F,G interfaces • In terms of Network signaling, the GSM architecture can be partitioned into 3 parts 1. databases 2. Switches 3. Radio System **Databases:** GSM utilizes databases such as HLR, VLR and AuC. It also consists of EIR which is used to maintain a list of legitimate , fraudulent mobile station(faulty) EIR is optional in GSM. AuC/EIR is a combined Node To accomplish mobility management, VLRs communicate using G interface and HLR to VLR using D interface **Switches :** • The GMSC performs necessary switching functions for mobile stations within the geographical area it controls. An MSC area is partitioned into several location areas. Each LA consists of many BTS. For originating a call from MS to a wireline user , the MSC communicates with SSP in the PSTN using SS7ISUP protocol • To deliver a call from PSTN to MS, the originating SSP in PSTN with Gateway MSC using SS&ISUP protocol • In Intersystem Handoff, 2 MSCs are required to communicate through E interface • To perform Mobility and call handling tasks, the MSC needs to communicate with HLR using the C interface and with VLR using B interface • To prevent Fraudulent handset usage, MSCcommunicates with EIR using F interface **Radio system** It consists of BSc, BTS and MS. The BSCs connect to MSC through A interface. BSC connects to BTS through A-Bis interface using ISDN link access protocol for D channel(LAPD). A BTS communicates with MS through radio interface Um	***4M for explanation***

SUMMER – 2022 EXAMINATION
MODEL ANSWER

Subject: Wireless & Mobile Network **Subject Code:** **22622**

	b)	**Draw the block diagram of a sensor node in WSN and state the function of various components.**	**6M**
	Ans.	• A Wireless Sensor Network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. • A WSN system incorporates a gateway that provides wireless connectivity back to the wired worldand distributed nodes.  • Sensors: Sensors are used by wireless sensor nodes to capture data from their environment. They arehardware devices that produce a measurable response to a change in a physical condition liketemperature or pressure. • Sensors are classified into two categories: Passive and Active sensors. ▪ Passive sensors sense the data without actually manipulating the environment by activeprobing. They are self-powered, that is, energy is needed only to amplify their analog signal. ▪ Active sensors actively probe the environment, for example, a sonar or radar sensor, and theyrequire continuous energy from a power source. • **Microcontroller:** The controller performs tasks, processes data and controls the functionality ofother components in the sensor node. While the most common controller is a microcontroller, otheralternatives that can be used as a controller are: a general purpose desktop microprocessor, digitalsignal processors, FPGAs (Field Programmable Gate Array) and ASICs (Application SpecificIntegrated Circuits). • **Digital signal Processors** may be chosen for broadband wireless communication applications,but in Wireless Sensor Networks the	***2M for diagram*** ***4M for explanation***

wireless communication is often modest: i.e., simpler, easierto process modulation and the signal processing tasks of actual sensing of data is lesscomplicated.

- **Transceivers:** Sensor nodes often make use of ISM band, which gives free radio, spectrum allocationand global availability. The possible choices of wireless transmission media are radiofrequency (RF), optical communication (laser) and infrared.
- **Memory:** Flash memories are used due to their cost and storage capacity. Memory requirements arevery much application dependent.
- **Power source:** Two power saving policies used are Dynamic Power Management (DPM) andDynamic voltage Scaling (DVS). DPM conserves power by shutting down parts of the sensor node which are not currently used or active. A DVS scheme varies the power levels within the sensor node depending on the non-deterministic workload.

c) **Compare WCDMA and CDMA 2000 on the basis of channel Bandwidth, Chip rate, Duplex mode, Modulation, Frame length and Power Control rate.** — **6M**

Ans.

Parameters	CDMA 2000	WCDMA
Channel Bandwidth	1.25MHz(1X),3.75MHz	5MHz
Chip Rate	1.2288Mcps(1X),3.6864Mcps(3X)	4-256
Duplex mode	Full duplex	Full duplex
Modulation	QPSK (forward link),BPSK (reverse link)	QPSK(both links)
Frame length	5ms(signaling),20,40, 80ms physical layer frames	10ms for physical layer,10,20,40 and 80 ms for transport layer
Power Control rate	800Hz in both the links	1500Hz in both the links

1M for each correct point