

SIXTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY -
MARCH, 2013

MOBILE COMPUTING

(Common for CT, CM & IF)

(Maximum Mark:100)

(Time:3hr)

PART - A

I. Answer the following questions in one or two sentences .Each question carries two mark

1. What is FDMA?

Frequency division multiple access (FDMA) comprises all algorithms allocating frequencies to transmission channels according to the frequency division multiplexing (FDM) scheme Channels can be assigned to the same frequency at all times, i.e., pure FDMA,

2. What you mean by elevation angle of satellite?

The elevation angle ε is defined as the angle between the center of the satellite beam and the plane tangential to the earth's surface.

3. Define Scatternet?

All users within one piconet have the same hopping sequence and share the same 1 MHz channel. As more users join the piconet, the throughput per user drops quickly (a single piconet offers less than 1 Mbit/s gross data rate). This led to the idea of forming groups of piconets called **scatternet**

4. Define VOIP?

VOIP is an acronym for Voice Over Internet Protocol, or in more common terms phone service over the Internet. If you have a reasonable quality Internet connection you can get phone service delivered through your Internet connection instead of from your local phone company.

5. List two features of infrared technology.

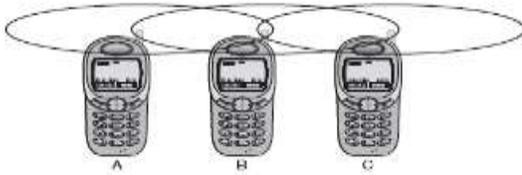
infra red data association (IrDA), uses wavelengths of approximately 850–900 nm to connect laptops, PDAs etc. Finally, visible light has been used for wireless transmission for thousands of years. light is not very reliable due to interference, but it is nevertheless useful due to built-in human receivers.

PART – B

II. Answer any five of the following. Each question carries 6 marks.

1. Write short note on hidden and exposed terminal.

A starts sending to B, C does not receive this transmission. C also wants to send something to B and senses the medium. The medium appears to be free, the carrier sense fails. C also starts sending causing a collision at B. But A cannot detect this collision at B and continues with its transmission. A is **hidden** for C and vice versa.



While hidden terminals may cause collisions, the next effect only causes unnecessary delay. Now consider the situation that B sends something to A and C wants to transmit data to some other mobile phone outside the interference ranges of A and B. C senses the carrier and detects that the carrier is busy (B's signal). C postpones its transmission until it detects the medium as being idle again. But as A is outside the interference range of C, waiting is not necessary. Causing a 'collision' at B does not matter because the collision is too weak to propagate to A. In this situation, C is **exposed** to B.

2. **Explain the various hand-overs on GSM.**

Hard handover: This handover type is already known from GSM and other TDMA/FDMA systems. Switching between different antennas or different systems is performed at a certain point in time..

Inter frequency handover, i.e., changing the carrier frequency, is a hard handover. Receiving data at different frequencies at the same time requires a more complex receiver compared to receiving data from different sources at the same carrier frequency.

Soft handover: This is the real new mechanism in UMTS compared to GSM and is only available in the FDD mode. Soft handovers are well known from traditional CDMA networks as they use **macro diversity**, a basic property of CDMA.

3. **List the two transport mechanism for DAB and explain each.**

Main service channel (MSC): The MSC carries all user data, e.g. audio, multimedia data. The MSC consists of **common interleaved frames (CIF)**, i.e., data fields of 55,296 bits that are sent every 24 ms (this interval depends on the transmission mode (ETSI, 2001a)). This results in a data rate of 2.304 Mbit/s.

- **Fast information channel (FIC):** The FIC contains **fast information blocks (FIB)** with 256 bits each (16 bit checksum). An FIC carries all control information which is required for interpreting the configuration and content of the MSC.

4. **Describe bluetooth application area.**

Wireless sensor networks: The technology required for sensor networks is located somewhere between 802.15.1 or .4 technology and the RFIDs (presented in the following paragraph). Sensor networks consist of many (thousands or more) nodes that are densely deployed, prone to failures, have very limited computing capabilities, and change their topology frequently.

Radio frequency identification (RFID): RF controllers have been well known for many years. They offer transmission rates of up to 115 kbit/s (wireless extension of a serial interface) and operate on many different ISM bands (depending on national regulations, e.g., 27, 315, 418, 426, 433, 868, 915 MHz).

Ultra wideband technology (UWB): This technology goes one step further related to spread spectrum used in WLANs as it transmits digital data over wide spectrum of frequency bands with very low power (UWB, 2002).

5. **Write a short note on CDMA 2000.**

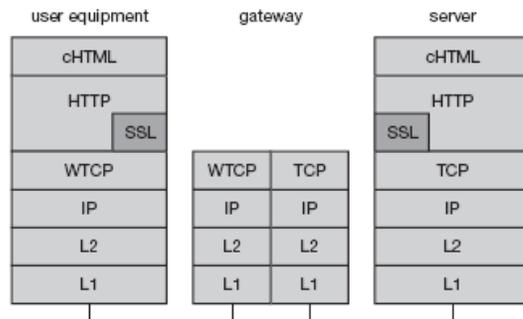
CDMA2000 (also known as C2K or **IMT Multi-Carrier (IMT-MC)**) is a family of 3G^[1] mobile technology standards, which use CDMA channel access, to send voice, data, and signaling data

between mobile phones and cell sites. The name CDMA2000 actually denotes a family of standards that represent the successive, evolutionary stages of the underlying technology. These are, in order of evolution:

- CDMA2000 1xRTT
- CDMA2000 1xEV-DO: Release 0, Revision A, Revision B
- CDMA2000 1xEV-DO Revision C or Ultra Mobile Broadband (UMB)
- CDMA2000 1xEVDV

CDMA2000 1X (IS-2000), also known as **1x** and **1xRTT**, is the core CDMA2000 wireless air interface standard. The designation "1x", meaning *1 times Radio Transmission Technology*, indicates the same radio frequency (RF) bandwidth as IS-95: a duplex pair of 1.25 MHz radio channels

6. Give an idea of WAP protocol, components and interface.



Typically, most new packet-oriented bearers offer IP services. On top of that, i-mode uses TCP with a wireless profile (see chapter 9) between the user equipment and the gateway. Gateways fulfill many purposes in the i-mode service translation of WTCP/TCP, address translation, protection of the user equipment etc. However, in contrast to WAP 1.x, the gateway does not break the security association between user equipment and server (SSL is simply tunneled through). cHTML/HTTP is added for browsing. Protocols like IP, TCP, HTTP etc. stem from the fixed internet and cHTML plus proprietary tags was introduced by NTT DoCoMo.

7. Give any three advantages of cellular system.

- **Higher capacity:** Implementing SDM allows frequency reuse. If one transmitter is far away from another, i.e., outside the interference range, it can reuse the same frequencies.
- **Less transmission power:** While power aspects are not a big problem for base stations, they are indeed problematic for mobile stations. A receiver far away from a base station would need much more transmit power than the current few Watts.
- **Local interference only:** With small cells, mobile stations and base stations only have to deal with 'local' interference.
- **Robustness:** Cellular systems are decentralized and so, more robust against the failure of single components. If one antenna fails, this only influences communication within a small area.

PART – C

(Answer one full question from each unit, Each question carries 15 mark)

Unit -1

III. (a) Explain any six applications of mobile computing.

Vehicles

cars will comprise many wireless communication systems and mobility aware applications. Music, news, road conditions, weather reports, and other broadcast information are received via digital audio broadcasting (DAB) with 1.5 Mbit/s

Emergencies

Vital information about injured persons can be sent to the hospital from the scene of the accident. All the necessary steps for this particular type of accident can be prepared and specialists can be consulted for an early diagnosis.

Business

A travelling salesman today needs instant access to the company's database: to ensure that files on his or her laptop reflect the current situation, to enable the company to keep track of all activities of their travelling employees, to keep databases consistent etc

Replacement of wired networks

e.g., remote sensors, for tradeshows, or in historic buildings. Due to economic reasons, it is often impossible to wire remote sensors for weather forecasts, earthquake detection, or to provide environmental information. Infotainment and more Internet everywhere? Not without wireless networks!

(b) List any six terms used in internet working and explain.

The **standard signaling system No. 7 (SS7)** is used for this purpose. SS7 covers all aspects of control signaling for digital networks (reliable routing and delivery of control messages, establishing and monitoring of calls). Features of SS7 are number portability, free phone/toll/collect/credit calls, call forwarding, three-way calling etc.

Home location register (HLR): The HLR is the most important database in GSM system as it stores all user-relevant information. This comprises static information, such as the mobile subscriber ISDN number (MSISDN), subscribed services

mobile subscriber ISDN number (MSISDN), subscribed services (e.g., call forwarding, roaming restrictions, GPRS), and the international mobile subscriber identity (IMSI). Dynamic information is

also needed, e.g., the current location area (LA) of the MS, the mobile subscriber roaming number (MSRN)

Visitor location register (VLR): The VLR associated to each MSC is a dynamic database which stores all important information needed for the MS users currently in the LA that is associated to the MSC (e.g., IMSI, MSISDN, HLR address).the **mobile subscriber**

roaming number (MSRN), the current VLR and MSC. As soon as an

MS leaves its current LA, the information in the HLR is updated. This information is necessary to localize a user in the worldwide GSM network.

OR

IV. (a) Explain Routers.

Routers are small physical devices that join multiple networks together. Technically, a router is a Layer 3 gateway device, meaning that it connects two or more networks and that the router operates at the network layer of the OSI model.

- Home networks typically use a wireless or wired Internet Protocol (IP) router, IP being the most common OSI network layer protocol. An IP router such as a DSL or cable modem broadband router joins the home's local area network (LAN) to the wide-area network (WAN) of the Internet.
- By maintaining configuration information in a piece of storage called the routing table, wired or wireless routers also have the ability to filter traffic, either incoming or outgoing, based on the IP addresses of senders and receivers.
- Some routers allow a network administrator to update the routing table from a Web browser interface. Broadband routers combine the functions of a router with those of a network switch and a firewall in a single unit.

(9)

(b) Compare SDMA, TDMA, FDMA and CDMA

Approach	SDMA	TDMA	FDMA	CDMA
Idea	Segment space into cells/sectors	Segment sending time into disjoint time-slots, demand driven or fixed patterns	Segment the frequency band into disjoint sub-bands	Spread the spectrum using orthogonal codes
Terminals	Only one terminal can be active in one cell/one sector	All terminals are active for short periods of time on the same frequency	Every terminal has its own frequency, uninterrupted	All terminals can be active at the same place at the same moment, uninterrupted
Signal separation	Cell structure directed antennas	Synchronization in the time domain	Filtering in the frequency domain	Code plus special receivers
Advantages	Very simple, increases capacity per km ²	Established, fully digital, very flexible	Simple, established, robust	Flexible, less planning needed, soft handover
Disadvantages	Inflexible, antennas typically fixed	Guard space needed (multi-path propagation), synchronization difficult	Inflexible, frequencies are a scarce resource	Complex receivers, needs more complicated power control for senders
Comment	Only in combination with TDMA, FDMA or CDMA useful	Standard in fixed networks, together with FDMA/SDMA used in many mobile networks	Typically combined with TDMA (frequency hopping patterns) and SDMA (frequency reuse)	Used in many 3G systems, higher complexity, lowered expectations; integrated with TDMA/FDMA

MA.

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(6)

Unit – II

V. With a suitable diagram Explain GSM system architecture.

(15)

(2.048 Mbit/s), carrying up to 30 64 kbit/s connections, whereas the O interface uses the Signalling System No. 7 (SS7) based on X.25 carrying management data to/from the RSS.

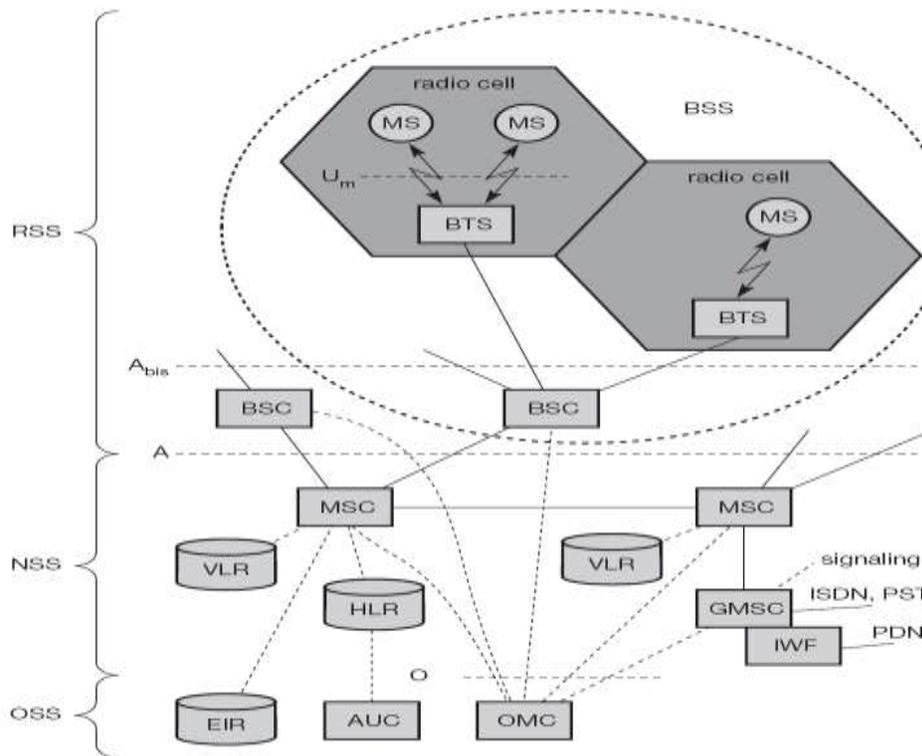
Base station subsystem (BSS): A GSM network comprises many BSSs, each controlled by a base station controller (BSC). The BSS performs all functions necessary to maintain radio connections to an MS, coding/decoding of voice, and rate adaptation to/from the wireless network part. Besides a BSC, the BSS contains several BTSs.

- **Base transceiver station (BTS):** A BTS comprises all radio equipment, i.e., antennas, signal processing, amplifiers necessary for radio transmission. A BTS can form a radio cell or, using sectorized antennas, several cells, and is connected to MS via the **Um interface** (ISDN U interface for mobile use), and to the BSC via the **Abis interface**.

The Abis interface consists of 16 or 64 kbit/s connections. A GSM cell can measure between some 100 m and 35 km depending on the environment (buildings, open space, mountains etc.) but also expected traffic.

The A interface is typically based on circuit-switched PCM-30 systems

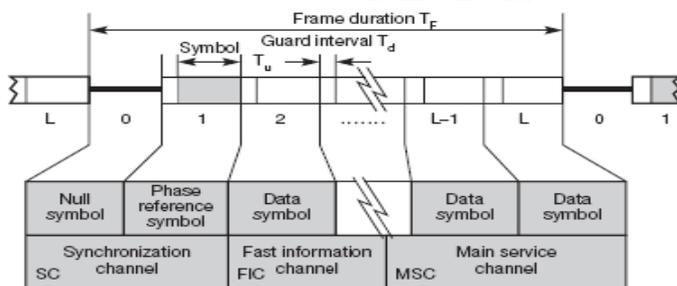
- **Base station controller (BSC):** The BSC basically manages the BTSs. It reserves radio frequencies, handles the handover from one BTS to another within the BSS, and performs paging of the MS. The BSC also multiplexes the radio channels onto the fixed network connections at the A interface.



OR

VI. (a) Describe DAB frame structure.

(7)

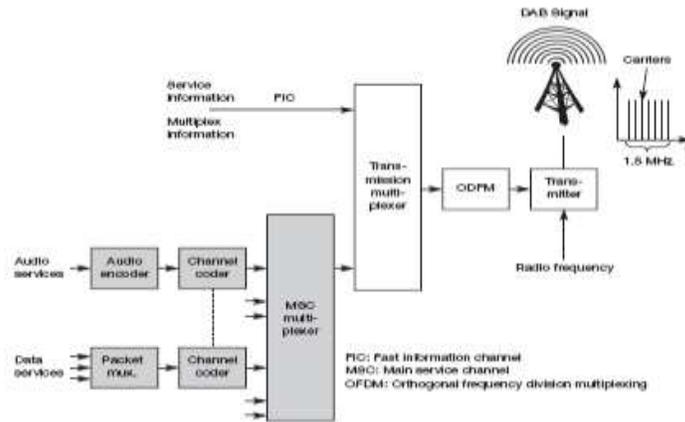


Each frame has a duration T_F of 24, 48, or 96 ms depending on the transmission mode. DAB defines four different transmission modes, each of which has certain strengths that make it more efficient for either cable, terrestrial, or satellite transmission (ETSI,2001a).

- Within each frame, 76 or 153 symbols are transmitted using 192, 384, 768, or 1,536 different carriers for COFDM. The guard intervals T_d protecting each symbol can be 31, 62, 123, or 246 μ s. Each frame consists of three parts. The **synchronization channel (SC)** marks the start of a frame. It consists of a null symbol and a phase reference symbol to synchronize the receiver.

(b) Discuss about the component of DAV sender.

(8)



Audio services are encoded (MPEG compression) and coded for transmission (FEC). All data services are multiplexed and also coded with redundancy. The MSC multiplexer combines all user data streams and forwards them to the transmission multiplexer. This unit creates the frame structure by interleaving the FIC. Finally, OFDM coding is applied and the DAB signal is transmitted.

Unit – III

VII. (a) Give three advantages and disadvantages of Infrared technology.

(6)

Advantages:

- its simple and extremely cheap senders and receivers which are integrated into nearly all mobile devices available today. PDAs, laptops, notebooks, mobile phones etc. have an infra red data association (IrDA) interface. Version 1.0 of this industry standard implements data rates of up to 115 kbit/s, while IrDA 1.1 defines higher data rates of 1.152 and 4 Mbit/s. No licenses are needed for infra red technology and shielding is very simple. Electrical devices do not interfere with infra red transmission.

- **Disadvantages** of infra red transmission are its low bandwidth compared to other LAN technologies. Typically, IrDA devices are internally connected to a serial port limiting transfer rates to 115 kbit/s. Even 4 Mbit/s is not a particularly high data rate. However, their main disadvantage is that infra red is quite easily shielded. Infra red transmission cannot penetrate walls or other obstacles. Typically, for good

(b) Explain Bluetooth usage models

(9)

Although Bluetooth started as a very simple architecture for spontaneous ad-hoc communication, many different protocols, components, extensions, and mechanisms

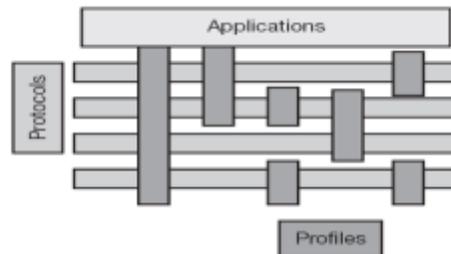
- have been developed over the last years. Application designers and vendors can implement similar, or even identical, services in many different ways using different components and protocols from the Bluetooth core standard. To provide compatibility among the devices offering the same services, Bluetooth specified many profiles in addition to the core protocols. Without the profiles too many parameters in Bluetooth would make interoperation between devices from different manufacturers almost impossible.

Profiles represent default solutions for a certain usage model. They use a selection of protocols and parameter set to form a basis for interoperability.

- Protocols can be seen as horizontal layers while profiles are vertical slices.
- The following **basic profiles** have been specified: generic

access, service discovery, cordless telephony, intercom, serial port, headset, dialup networking, fax, LAN access, generic object exchange, object push, file transfer, and synchronization.

- **Additional profiles** are: advanced audio distribution, PAN, audio video remote control, basic printing, basic imaging, extended service discovery, generic audio video distribution, hands-free, and hardcopy cable replacement. Each profile selects a set of protocols.



OR

VIII. Explain Wireless LAN with its advantages and disadvantages.

(15)

Advantages of WLANs are:

- **Flexibility:** Within radio coverage, nodes can communicate without further restriction. Radio waves can penetrate walls, senders and receivers can be placed anywhere (also non-visible, e.g., within devices, in walls etc.). Sometimes wiring is difficult if firewalls separate buildings (real firewalls made out of, e.g., bricks, not routers set up as a firewall).

- **Planning:** Only wireless ad-hoc networks allow for communication without previous planning, any wired network needs wiring plans. As long as devices follow the same standard, they can communicate. For wired networks, additional cabling with the right plugs and probably interworking units (such as switches) have to be provided.

- **Design:** Wireless networks allow for the design of small, independent devices which can for example be put into a pocket. Cables not only restrict users but also designers of small PDAs, notepads etc. Wireless senders and receivers can be hidden in historic buildings, i.e., current networking technology can be introduced without being visible.

- **Robustness:** Wireless networks can survive disasters, e.g., earthquakes or users pulling a plug. If the wireless devices survive, people can still communicate. Networks requiring a wired infrastructure will usually break down completely.

- **Cost:** After providing wireless access to the infrastructure via an access point for the first user, adding additional users to a wireless network will not increase the cost. This is, important for e.g., lecture halls, hotel lobbies or gate areas in airports where the numbers using the network may vary significantly.

Disadvantages:

- **Quality of service:** WLANs typically offer lower quality than their wired counterparts. The main reasons for this are the lower bandwidth due to limitations in radio transmission (e.g., only 1–10 Mbit/s user data rate instead of 100–1,000 Mbit/s)

- **Proprietary solutions:** Due to slow standardization procedures, many companies have come up with proprietary solutions offering standardized functionality plus many enhanced features (typically a higher bit rate using a patented coding technology or special inter-access point protocols).

- **Safety and security:** Using radio waves for data transmission might interfere with other high-tech equipment in, e.g., hospitals.

Unit – IV

IX. (a) Describe WLL

(8)

Wireless means transmitting signals using radio waves as the medium instead of wires. Wireless technologies are used for tasks as simple as switching off the television or as complex as supplying the sales force with information from an automated enterprise application while in the field. Now cordless keyboards and mice, PDAs, pagers and digital and cellular phones have become part of our daily life.

Some of the inherent characteristics of wireless communications systems which make it attractive for users, are given below:

- **Mobility:** A wireless communications system allows users to access information beyond their desk and conduct business from anywhere without having a wire connectivity.
- **Reachability:** Wireless communications systems enable people to be better connected and reachable without any limitation of any location.
- **Simplicity:** Wireless communication system are easy and fast to deploy in comparison of cabled network. Initial setup cost could be a bit high but other advantages overcome that high cost.
- **Maintainability:** Being a wireless system, you do not need to spend too much to maintain a wireless network setup.
- **Roaming Services:** Using a wireless network system, you can provide service anywhere any time including train, buses, aeroplanes etc.
- **New Services:** Wireless communications systems provide new smart services like SMS and MMS.

Wireless Network Topologies:

There are basically three ways to set up a wireless network.

- **Point-to-point bridge:** As you know a bridge is used to connect two networks. A *point-to-point bridge* interconnects two buildings having different networks. For example, a wireless LAN bridge can interface with an Ethernet network directly to a particular access point.
- **Point-to-multipoint bridge:** This topology is used to connect three or more LANs that may be located on different floors in a building or across buildings.
- **Mesh or ad hoc network:** This network is an independent local area network that is not connected to a wired infrastructure and in which all stations are connected directly to one another.

Wireless Technologies:

Wireless technologies can be classified in different ways depending on their range. Each wireless technology is designed to serve a specific usage segment. The requirements for each usage segment are based on a variety of variables, including Bandwidth needs, Distance needs and Power.

Wireless wide area network (wwan):

This network enables you to access the Internet via a wireless wide area network (WWAN) access card and a PDA or laptop.

These networks provide a very fast data speed compared with the data rates of mobile telecommunications technology, and their range is also extensive. Cellular and mobile networks based on CDMA and GSM are good examples of WWAN.

Wireless personal area network (wpan):

These networks are very similar to WWAN except their range is very limited.

Wireless local area network (wlan):

This network enables you to access the Internet in localized hotspots via a wireless local area network (WLAN) access card and a PDA or laptop.

It is a type of local area network that uses high-frequency radio waves rather than wires to communicate between nodes.

These networks provide a very fast data speed compared with the data rates of mobile telecommunications technology, and their range is very limited. Wi-Fi is the most widespread and popular example of WLAN technology.

Wireless metropolitan area network (wman):

This network enables you to access the Internet and multimedia streaming services via a wireless region area network (WRAN).

These networks provide a very fast data speed compared with the data rates of mobile telecommunication technology as well as other wireless network, and their range is also extensive.

(b) Compare Wi-Max and Wi-Fi

(7)

Feature	WiMax (802.16a)	Wi-Fi (802.11b)	Wi-Fi (802.11a/g)
Primary Application	Broadband Wireless Access	Wireless LAN	Wireless LAN
Frequency Band	Licensed/Unlicensed 2 G to 11 GHz	2.4 GHz ISM	2.4 GHz ISM (g) 5 GHz U-NII (a)
Channel Bandwidth	Adjustable 1.25 M to 20 MHz	25 MHz	20 MHz
Half/Full Duplex	Full	Half	Half
Radio Technology	OFDM (256-channels)	Direct Sequence Spread Spectrum	OFDM (64-channels)
Bandwidth Efficiency	<=5 bps/Hz	<=0.44 bps/Hz	<=2.7 bps/Hz
Modulation	BPSK, QPSK, 16-, 64-, 256-QAM	QPSK	BPSK, QPSK, 16-, 64-QAM
FEC	Convolutional Code Reed-Solomon	None	Convolutional Code
Encryption	Mandatory- 3DES	Optional- RC4	Optional- RC4

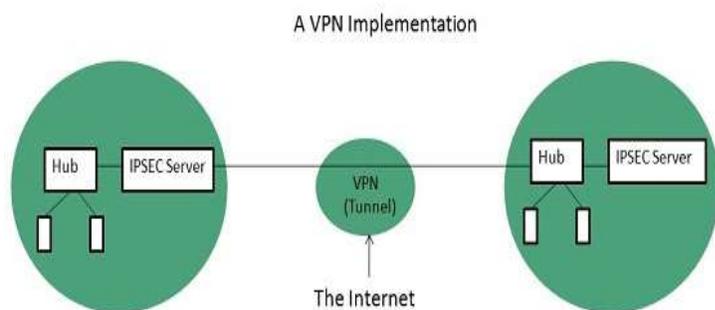
	Optional- AES	(AES in 802.11i)	(AES in 802.11i)
Mobility	Mobile WiMax (802.16e)	In development	In development
Mesh	Yes	Vendor Proprietary	Vendor Proprietary
Access Protocol	Request/Grant	CSMA/CA	CSMA/CA

OR

X. (a) Discuss VPN

(8)

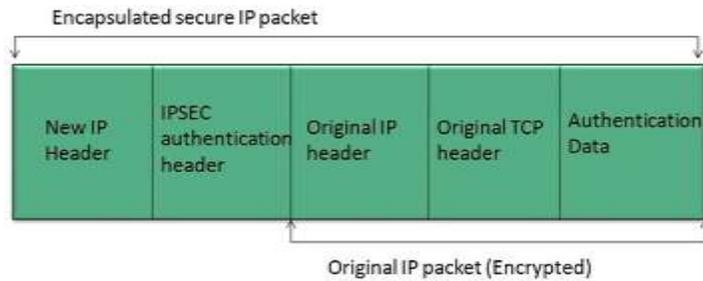
Extranet is implemented as a Virtual Private Networks (VPN) because it uses internet to connect to corporate organization and there is always a threat to information security. VPN offers a secure network in public infrastructure (Internet).



Key Points

- The packet is encapsulated at boundary of networks in IPSEC compliant routers.
- It uses an encryption key to encapsulate packets and IP addresses as well.
- The packet is decoded only by the IPSEC compliant routers or servers.
- The message is sent over VPN via VPN Tunnel and this process is known as tunneling.

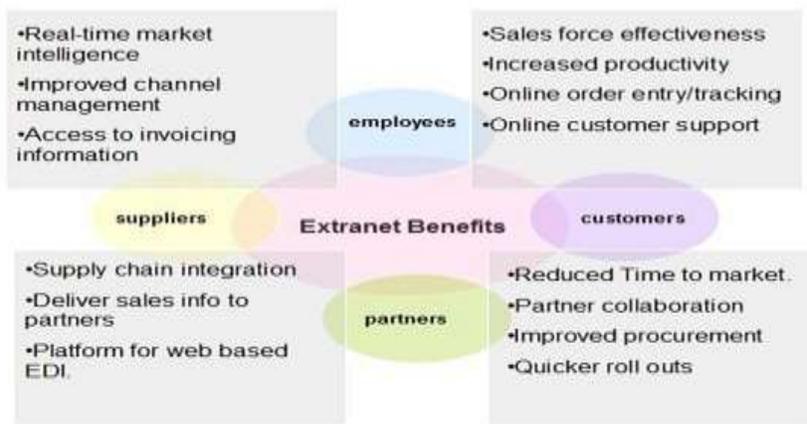
VPN uses **Internet Protocol Security Architecture (IPSEC)** Protocol to provide secure transactions by adding an additional security layer to TCP/IP protocol. This layer is created by encapsulating the IP packet to a new IP packet as shown in the following diagram:



(b) Describe different types of VPN and its goals.

(7)

extranet proves to be a successful model for all kind of businesses whether small or big. Here are some of the advantages of extranet for employees, suppliers, business partners, and customers:



Issues

Apart for advantages there are also some issues associated with extranet. These issues are discussed below:

Hosting

Where the extranet pages will be held i.e. who will host the extranet pages. In this context there are two choices:

- Host it on your own server.
- Host it with an Internet Service Provider (ISP) in the same way as web pages.

But hosting extranet pages on your own server requires high bandwidth internet connection which is very costly.

Security

Additional firewall security is required if you host extranet pages on your own server which result in a complex security mechanism and increase work load.

- Accessing Issues

Information can not be accessed without internet connection. However, information can be accessed in Intranet without internet connection.

- Decreased Interaction

It decreases the face to face interaction in the business which results in lack of communication among customers, business partners and suppliers.

- Extranet vs. Intranet

The following table shows differences between Extranet and Intranet:

www.madinpoly.com