

U20CS855 - MOBILE AND PERVASIVE COMPUTING

UNIT I - PERVASIVE COMPUTING

PART – A

1. What is Pervasive computing? (Nov 2014, May 2014, may 2012, nov 2011)

Pervasive computing goes beyond the realm of personal computers: it is the idea that almost any device, from clothing to tools to appliances to cars to homes to the human body to your coffee mug, can be imbedded with chips to connect the device to an infinite network of other devices.

2. What are the limitations of accessing pervasive computing via WAP? (Nov 2014)

- Small display
- Restricted input capability
- Limited memory and processing power
- Low speed network connections with high latency.

3. Give some application areas of pervasive computing. (Nov 2013, May 2013)

- Retail,
- Airlines check in and booking,
- Health Care,
- Tracking,
- Car Information System,
- mail.

4. What are principles of pervasive computing?

- Decentralization
- Diversification
- Connectivity
- Simplicity

5. Give the Security features of pervasive computing

- Multilevel
- Flexibility and customizability
- Context-Awareness
- Interoperability
- Extended boundaries

6. List out the devices for pervasive computing? (may 2012, nov 2012)

- Devices,
- Sensors,
- processors,
- actuators

7. What are the protocols used in pervasive computing?

- Sync ML,
- Jini,
- Service Location protocol

8. Give the Security features of pervasive computing

- Multilevel
- Flexibility and customizability
- Context-Awareness
- Interoperability
- Extended boundaries

9. What are the operating system for pervasive computing?

Centralized OSes, Networked OSes, Distributed OSes, Classification based on Kernel / Core Styling, Monolithic Kernel based OSes, Microkernel based OSes, Exokernel based OSes, classification based on hardware form-factor and scope, Server-class OSes (with and without real-time support).

10. Write about EPOC OS?

- It is specifically designed for phones.
- It supports Unicode, It can display 256 colours.
- It consists of the following features.
- User Management, Task Management, User interface, Memory management.

11. What do you mean by smart phone?

Smart phones combine a mobile phone with a handheld organizer into an all-in-one communication system.

12. Give any four pervasive device names?

- Information access device
- Intelligent appliances
- Smart controls
- Entertainment systems

13. Define Devices.

PCS devices are likely to assume many different forms and sizes, from handheld units (similar to mobile phones) to near-invisible devices set into ‘everyday’ objects (like furniture and clothing). These will all be able to communicate with each other and act intelligently.

14. Define Sensors.

Sensors: input devices that detect environmental changes, user behaviours, human commands etc.,

15. Define Processors.

Processors: electronic systems that interpret and analyze input-data;

16. What do you mean by embedded control?

It describes how pervasive information technology will be used in embedded home and automotive settings.

17. Give the hardware parts of hand device?

Battery, Displays, Memory, Processors.

18. What are all the types of Keyboards?

- On-Screen keyboard(Qwerty)
- Fitaly Keyboard
- Octave

19. Explain the Pervasive computing applications (Nov 2011, Nov/Dec 2014)

- Information access
- Text retrieval
- Mobility and networking
- Multimedia document retrieval
- Device discovery
- Automatic indexing
- Wireless protocols
- Pervasive devices
- Security
- Palm top computers
- Voice and video over IP
- Smart badges
- Perceptive interfaces

- Electronic books
- Biometric person ID
- User sensitive devices
- Speech recognition
- Gesture recognition

20. What are the scope of SyncML?

- XML based framework for data synchronization
- Message oriented data exchange protocol
- Transport agnostic
- Universal deployment
- Extension for device management

UNIT II - MOBILE APPLICATIONS

PART – A

1. Evolution of Devices

Mobile technology has gone through many different evolutions to get to where it is today. In the industry, we often refer to these evolutions as “generations” or simply “G,” which refers to the maturity and capabilities of the actual cellular networks. The cellular network is only one element of the overall mobile ecosystem.

2. List the five distinct eras of devices

- The Brick Era
- The Candy Bar Era
- The Feature Phone Era
- The Smartphone Era
- The Touch Era

3. What is Mobile Ecosystem

Mobile Ecosystem is collection of multiple devices (mobile phones, Tablet, Phablet etc), software (operating system, development tools, testing tools etc.), companies (device manufacturers, carrier, apps stores, development/testing companies, etc.) etc., and the process by which data (sms, bank transactions etc.), is transferred/shared by a user from one device to another device or by the device itself based on some programs (Birthday, Wedding Messages, calendar).

4. What are the layers of Mobile Ecosystem?

- Operators
- Networks
- Devices
- Platforms
- Operating Systems
- Application Frameworks
- Applications
- Services

5. What is platform in Mobile Ecosystem

A mobile platform's primary duty is to provide access to the devices. To run software and services on each of these devices, you need a platform, or a core programming language in which all of your software is written. Like all software platforms, these are split into three categories: licensed, proprietary, and open source.

6. What are the different types of medium in mobile application?

- SMS
- Mobile Websites
- Mobile Web Widgets
- Mobile Web Applications
- Native Applications
- Games

7. What Is Information Architecture?

The structural design of shared information environments. The combination of organizations, labeling, search, and navigation systems within websites and intranets. The art and science of shaping information products and experiences to support usability and findability

8. What are the umbrella term to describe several unique disciplines in information architecture?

- Information architecture
- Interaction design
- Information design
- Navigation design
- Interface design

9. Define Wireframes?

Wireframes are a way to lay out information on the page, also referred to as information design. Site maps show how our content is organized in our informational space; wireframes show how the user will directly interact with it. Wireframes are like the peanut butter to the site map jelly in our information architecture sandwich. It's the stuff that sticks.

10. What are the type of prototyping?

- Paper Prototype
- Context Prototype
- Html Prototype

11. Define HTML Prototype?

The Html Prototype is creating a lightweight, semifunctional static prototype using XHTML, CSS, and JavaScript, if available. This is a prototype that you can actually load onto a device and produce the nearest experience to the final product, but with static dummy content and data (Figure 7-14). It takes a little extra time, but it is worth the effort.

12. List the elements of Mobile Design

- Context
- Message
- Look and Feel
- Layout
- Color
- Typography
- Graphics

13. Mobile Design Tool?

Mobile design requires understanding the design elements and specific tools. The closest thing to a common design tool is Adobe Photoshop, though each framework has a different method of implementing the design into the application. Some frameworks provide a complete interface toolkit, allowing designers or developers to simply piece together the interface, while others leave it to the designer to define from scratch.

14. Why Is Adaptation a “Necessity”?

Is multiserving a “necessity” like Luca suggests, and if so, why? Yes, multiserving your content in one way or another is absolutely a necessity. If you have a website and you want to have a mobile website, web app, or even native application that shares content in some way with another context, you are going to need to figure out a strategy to make that happen.

15. Why creating a test plan for mobile device?

Creating a test plan for mobile devices means testing for every possible problem that the phone might encounter and that might result in it failing to present the desired content to the user. Because these devices are never from a fixed list like we are accustomed to with the desktop web, that means this can be a pretty big list of things to test. Multiply that by a larger number of devices and you can start to see that this can take some time.

16. What is Usability Testing?

Testing a mobile project with actual users always presents invaluable feedback—it gives you an outside perspective directly from your target users. The more you can test your project, the more data and insight you gain into the potential success or failure of your work.

17. How to define context?

Define context in two ways. There is “Context” with a big C and “context” with a little c. These are often used interchangeably with no preference or distinction. Although they are the same word, they have two different implied meanings. This isn’t to say that the case of a letter makes one more important than the other. It only helps to make a distinction between lofty big ideas (big C) and the more practical and more invisible intention of use (little c).

18. What is Context with a Capital C

Context with a capital C is how the users will derive value from something they are currently doing, or in other words, the understanding of circumstance. It is the mental model they will establish to form understanding.

19. What is Context with a Lowercase c

The context with a lowercase c is the mode, medium, or environment in which we perform a task or the circumstances of understanding. The following sections look at the three types of context with a little c.

20. Define Cross Platform Development?

Cross-platform development is the practice of developing software products or services for multiple platforms or software environments. Engineers and developers use various methods to accommodate different operating systems or environments for one application or product.

Example,

- **React Native:** Uses JavaScript and React to build cross-platform apps.
- **Flutter:** Developed by Google, uses the Dart programming language.
- **Xamarin:** Uses C# and .NET to build cross-platform apps.

UNIT III - MEDIUM ACCESS AND TELECOMMUNICATIONS

PART – A

1. Define Frequency and types?

The frequency is the number of oscillations per unit time. It is used for defining the cyclic process like rotation, oscillation, wave etc. The completion of the cyclic process at particular interval of time is known as the frequency

- Angular Frequency
- Spatial Frequency

2. Define Signals?

Signals are the physical representation of data. Users of a communication system can only exchange data through the transmission of signals. Signals are functions of time and location. Signal parameters represent the data values. The most interesting types of signals for radio transmission are periodic signals, especially $\sin(\omega t)$ waves as carriers.

3. What is multi path propagation?

Together with the direct transmission from a sender to a receiver, the propagation effects mentioned in the previous section lead to one of the most severe radio channel impairments, called multi-path propagation.

4. What is a Handover?

A single cell does not cover the whole service area. The process of transferring an ongoing call or data session from one channel connected to the core network to another channel.

5. What is authentication centre?

As the radio interface and mobile stations are particularly vulnerable a separate AuC has been defined to protect user identity and data transmission. The AuC contains the algorithms for authentication as well as the keys for encryption and generates the values needed for user authentication in the HLR. The AuC may, in fact, be situated in a special protected part of the HLR.

6. What are the main benefits of a spread spectrum?

The main benefit of spread spectrum is the resistance to narrow band interference. The spread spectrum converts the narrow band into broad band signal. The energy needed to transmit the signal is the same, but it is now spread over a large frequency range. Thus

the power level of the signal can be much lower than that of the original narrowband signal.

7. What are the advantages of GSM? (Nov 2014)

- Localization and calling,
- Handover,
- Security,
- Authentication,
- confidentiality,
- Anonymity.

8. What are the four types of handover available in GSM? (Nov 2014)

- Intra-cell handover
- Inter-cell, intra-BSC handover
- Inter-BSC, Intra-MSC handover
- Inter MSC handover

9. What are the types of services in GSM? (May 2014)

- Bearer Services
- Tele Services
- Supplementary services

10. What are the disadvantages of Cellular systems? (May 2014)

Infrastructure needed, Handover needed and Frequency planning.

11. What are the different types of access mechanisms? (Nov 2013)

- Space Division Multiple Access (SDMA)
- Frequency Division Multiple Access (FDMA)
- Time Division Multiple Access (TDMA)
- Code Division Multiple Access (CDMA).

12. Define SDMA?

Space Division Multiple Access (SDMA) is used for allocating a separated space to users in wireless networks. A typical application involves assigning an optimal base station to a mobile phone user. The mobile phone may receive several base stations with different quality. The basis for the SDMA algorithm is formed by cells and sectorized antennas which constitute the infrastructure implementing space division multiplexing (SDM).

13. Define TDMA?

A more flexible multiplexing scheme for typical mobile communications is time division multiplexing (TDM). Compared to FDMA, time division multiple access (TDMA) offers a much more flexible scheme, which comprises all technologies that allocate certain time slots for communication.

14. Define CDMA?

Code division multiple access systems apply codes with certain characteristics to the transmission to separate different users in code space and to enable access to a shared medium without interference. All terminals send on the same frequency probably at the same time and can use the whole bandwidth of the transmission channel. Each sender has a unique random number, the sender XORs the signal with this random number. The receiver can “tune” into this signal if it knows the pseudo random number, tuning is done via a correlation function

15. Define FDMA?

Frequency division multiplexing (FDM) describes schemes to subdivide the frequency dimension into several non-overlapping frequency bands. Frequency Division Multiple Access is a method employed to permit several users to transmit simultaneously on one satellite transponder by assigning a specific frequency within the channel to each user. Each conversation gets its own, unique, radio channel.

16. How is authentication done in GSM network? (Nov 2013)

The AUC is a processor system; it performs the —authentication‖ function. It will normally be co-located with the Home Location Register (HLR) as it will be required to continuously access and update, as necessary, the system subscriber records. The AUC/HLR Centre can be co-located with the MSC or located remote from the MSC. The authentication process will usually take place each time the subscriber —initializes‖ on the system.

17. What does the Mobility Management (MM) layer do? (May/June 2013)

The main function of the Mobility Management sub layer is to support the mobility of user terminals, such as informing the network of its present location and providing user identity confidentiality. A further function of the MM sub layer is to provide connection management services to the different entities of the upper Connection Management (CM) sub layer.

18. What are the basic groups of logical channels?

GSM specifies 2 basic groups: Traffic channels and Control channels.

19. What is Network and Switching subsystem?

The heart of the GSM is formed by the Network and Switching System (NSS). NSS consists of the following switches and databases:

- Mobile Services switching center (MSC)
- Home Location register (HLR)
- Visitor Location Register (VLR)

20. What is GPRS?

General packet radio service (GPRS) is a packet oriented mobile data service available to users of the 2G cellular communication systems, 3G systems and GSM. GPRS re use the existing GSM infrastructure. It interworked with existing circuit-switched services. It is based on standardized open interfaces.

UNIT IV - WIRELESS NETWORKS

PART – A

1. What are the design goals of 802.11? (Nov 2014) (May 2014)

- To deliver services in wired networks, to achieve high throughput
- To achieve highly reliable data delivery
- To achieve continuous network connection

2. Difference between Infrared light and Radio way?

Infrared light:

- This technology use diffuse light reflected at walls, furniture etc. or directed light if an line-of-sight (LOS) exists between sender and receiver.
- Infrared system are simple in design, therefore it is inexpensive.
- InfraLAN is an example of wireless LANs using infrared technology.

Radio way:

- It is more popular and uses radio transmission in the GHz range.
- Almost all networks which are used any technology based on radio waves for data transmission.
- RF systems must used spread spectrum technology in the united states.
- This spread spectrum technology currently comes in two types : DSSS and FHSS. • E.g. GSM at 900,1,800,1,900 MHz etc.

3. Difference between Infrastructure and Ad-hoc Network?

Infrastructure:

- The infrastructure mode includes one or several interconnected WLAN-cell, which are connected to a fixed net through an access point.
- Wireless access points can be simply thought to function in a fashion analogous to Ethernet hub and switch are used to allow computers with wireless adapter to participate in a network.
- All device-to-device wireless communication goes through the WAP.
- This is referred to as infrastructure mode.

Ad-hoc Networks:

- The ad-hoc mode is WLAN-cell interacting without connection to wired networks, i.e., without connection to an access point.

- However, the ad hoc networks work much like the Bluetooth. • No access point is needed and the devices might connect to the internet through wired or other wireless techniques.
- Simple computing device to computing device wireless networking can be accomplished by installing a wireless network adapter (sometimes called wireless NICs) in each device. This is referred to as ad-hoc mode.

4. Distinguish between Wi Fi and Wi Max? (May/June 2013)

Wifi: Generally, the most common usage of Wi fi technology is for lap top users to gain internet access in locations such as airports, coffee shops, and so on. It can be used to help consumers in their pursuit of work – based or recreational internet usage.

Wi Max: It provides a higher speed wireless internet access, it can be running at a speed up to 70M, three times as faster as 3G networks. It provides the last mile of internet access; it can connect WiFi hotspots to the internet and provide a wireless alternative to cables and DSL.

5. What are the services of IEEE 802.11? (May-2012)

Station services: authentication, de-authentication, privacy, delivery of data Distribution Services (A thin layer between MAC and LLC sub layer) Association, disassociation, re association distribution, Integration.

6. What do you mean by Wifi?

Wi-Fi is a trademark of the Wi-Fi Alliance. A Wi-Fi enabled device such as a personal computer, video game console, smart phone, and digital audio player can connect to the Internet when within range of a wireless network connected to the Internet. The coverage of one or more (interconnected) access points — called hotspots when offering public access — generally comprises an area the size of a few rooms but may be expanded to cover many square miles, depending on the number of access points with overlapping coverage.

7. What is PAN?

A personal area network (PAN) is a computer network used for communication among computer devices, including telephones and personal digital assistants, in proximity to an individual's body. The devices may or may not belong to the person in question. The reach of a PAN is typically a few meters. PANs can be used for communication among the personal devices themselves (intrapersonal communication), or for connecting to a higher level network and the Internet (an uplink).

8. Explain the Problems with Wireless Networks

- Operates in a less controlled environment, so is more susceptible to interference, signal loss, noise, and eavesdropping.
- Generally, wireless facilities have lower data rates than guided facilities.
- Frequencies can be more easily reused with guided media than with wireless media.

9. Why 802.11a?

- Greater bandwidth (54Mb)
- Less potential interference (5GHz)
- More non-overlapping channels

10. What are the components of the IEEE 802.11?

- Station,
- BSS - Basic Service Set,
- ESS - Extended Service Set,
- DS – Distribution System.

11. What do you mean by WLAN?

Wireless local area network (LAN) is a local area data network without wires. • Wireless LAN is also known as WLAN in short. • WLAN is a high-speed data networking technology that is being widely deployed in residential network, enterprises, and public areas around the world.

12. What do you mean by Bluetooth? (Nov-2012)

Bluetooth is a proprietary open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions) from fixed and mobile devices, creating PAN with high levels of security.

13. Mention the elements of Bluetooth core protocols? (May 2014)

- Link Manager protocol
- Logical link control and adaptation protocol(L2CAP)
- Service discovery protocol

14. How does a new Bluetooth device discover a Bluetooth network? (Nov 2013)

Bluetooth is a wireless technology standard for exchanging data over short distances (using short wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz^[2]) from fixed and mobile devices, and building personal area networks (PANs). It was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

15. What are the three low power states provided by the Bluetooth? (Nov 2014)

1. Sniff state
2. Hold state
3. Park State.

16. Define piconet?

- Piconet is a type of Bluetooth network that contains one primary node called the master node and seven active secondary nodes called slave nodes.
- Thus, we can say that there is a total of 8 active nodes which are present at a distance of 10 meters.
- The communication between the primary and secondary nodes can be one-to-one or one-to-many.

17. Define Scatternet?

- It is formed by using various piconets. A slave that is present in one piconet can act as master or we can say primary in another piconet.
- This kind of node can receive a message from a master in one piconet and deliver the message to its slave in the other piconet where it is acting as a master.
- This type of node is referred to as a bridge node. A station cannot be mastered in two piconets.

18. What are the applications of Bluetooth?

- It can be used in laptops, and in wireless PCs, printers.
- It can be used in wireless headsets, wireless PANs, and LANs.
- It can connect a digital camera wirelessly to a mobile phone.
- It can transfer data in terms of videos, songs, photographs, or files from one cell phone to another cell phone or computer.
- It is used in the sectors of Medical health care, sports and fitness, Military.

19. What are the design goals for wireless LANs?

- Global, Faultless operation
- Low power for battery use
- No special permissions or licenses needed to use the LAN
- Robust transmission technology
- Simplified spontaneous cooperation at meetings
- Easy to use for everyone, simple management

20. What is satellite network?

A satellite network has a ground-based station that uses a transceiver to control it. The network also has ground stations for users to send and receive communication through the satellite system. A satellite is a device in space that can receive signals from Earth and send them back to the same place or a different location.

UNIT V - MOBILE NETWORK AND TRANSPORT LAYERS

PART – A

1. List the requirements for Mobile IP. (Nov 2014, Nov 2011)

- Compatibility,
- Transparency,
- Scalability and efficiency,
- Security.

2. Distinguish between proactive and active routing. (Nov 2014, June 2013)

Proactive routing: Every node maintains one or more tables representing the entire topology of the network, this table are updated regularly. In order to maintain an up-to-date routing information from each node to every other node. It maintains up to date routing information and topology information on a regular basis.

Reactive routing: Table maintenance is different from proactive protocol. Attempt to discover route only on demand basis.

3. Define triangular routing. (May 2014)

The inefficient behaviour of a non-optimized mobile IP is called triangular routing. The triangle is made up of three segments, CN to HA, HA to COA\MN, and MN back to CN. Triangular routing is a method for transmitting packets of data in communications networks. It uses a form of routing that sends a packet to a proxy system before transmission to the intended destination. Triangular routing is a problem in mobile IP, however it finds applications in other networking situations

4. What is the basic purpose of DHCP? (May 2014, May 2013)

The dynamic host configuration protocol is mainly used to simplify the installation and maintenance of networked computers

5. Write any two factors that affect the performance of ADHOC networking? (Nov 2013)

Node speed, pause-time, network size, number of traffic sources, and type of routing (source Versus distributed), that affect the performance of ad hoc networks.

6. What do you mean by zone routing protocol? (Nov 2013)

ZRP is a hybrid Wireless Networking routing protocol that uses both proactive and reactive routing protocols when sending information over the network. ZRP was

designed to speed up delivery and reduce processing overhead by selecting the most efficient type of protocol to use throughout the route.

7. What is the goal of M-TCP? (Nov 2011)

The goal of M-TCP is to prevent the sender window from shrinking if bit errors or disconnection but not congestion cause current problems. It wants

- To provide overall throughput
- To lower the delay
- To maintain end-to-end semantics of TCP
- To provide a more efficient handover.

8. What led to the development of Indirect TCP? (Nov 2012, may 2012)

- TCP performs poorly together with wireless links
- TCP within the fixed network cannot be changed.
- This led to the development of I-TCP which segments a TCP connection into a fixed part and a wireless part.

9. Define a tunnel. (may 2012)

A tunnel establishes a virtual pipe for data packets between a tunnel entry and a tunnel endpoint. Packets entering a tunnel are forwarded inside the tunnel and leave the tunnel unchanged.

10. Mention the different entities in a mobile IP.

Mobile Node, Correspondent Node, Home Network, Foreign Network, Foreign Agent, Home Agent, Care-Of address, Foreign agent COA and Co-located COA.

11. What do you mean by mobility binding?

The Mobile Node sends its registration request to the Home Agent. HA now sets up a mobility binding containing the mobile node's home IP address and the current COA.

12. Define binding request.

Any node that wants to know the current location of an MN can send a binding request to the HA. The HA can check if the MN has allowed dissemination of its current location. If the HA is allowed to reveal the location it sends back a binding update.

13. What is known as Binding update?

This message sent by the HA to CNs reveals the current location of the MN. The message contains the fixed IP address of the MN and the COA. The binding update can request an acknowledgement.

14. Explain destination sequence distance vector routing.

Destination sequence distance vector routing is an enhancement to distance vector routing for ad-hoc networks and is used as routing information protocol in wired networks.

15. What are the general problems of mobile IP regarding security and support of quality of service?

Mobility poses many security problems. A minimum requirement is the authentication of all messages related to the management of mobile IP. It must be sure for the IP layer if it forwards a packet to a mobile host that this host really is the receiver of the packet. The IP layer can only guarantee that the IP addresses of the receiver is correct. There are no ways of preventing faked IP address or other attacks. According to Internet philosophy this is left to higher layers.

16. Why is routing in AdHoc networks complicated?

Traditional routing algorithms for wired networks will not work Routing in wireless network cannot rely on layer three knowledge alone. Centralized approaches will not work. Many nodes need routing capabilities.

17. What is encapsulation?

Encapsulation is the mechanism of taking a packet consisting of packet header and data putting it into the data part of a new packet.

18. What is the use of network address translation?

The network address translation is used by many companies to hide internal resources and to use only some globally available addresses.

19. Define binding warning.

If a node decapsulates a packet for a MN, but it is not the current FA for this MN, this node sends a binding warning. The warning contains MN's home address and a target node address.

20. What is meant by a binding cache?

One way to optimize the route is to inform the CN of the current location by caching it in a binding cache which is a part of the local routing table for the CN.