



Bapatla Engineering College::Bapatla
III/IV B .Tech(Regular)Degree examination
April 2017

Scheme of evaluation for Wireless Networks (14IT602)

1. Answer all questions.

1x12=12M

a. Why does collision occur?

(1M)

Ans)

A collision is the situation that occurs when two or more devices attempt to send a signal along the same transmission channel at the same time

b. List any two advantages of wireless networks.

(1M)

Ans)

1. Increased mobility
2. Increased productivity
3. Scalability

c. What is the difference Bandwidth and Data rate?

(1M)

Ans)

Bandwidth is also defined as the amount of data that can be transmitted in a fixed amount of time. For digital devices, the *bandwidth* is usually expressed in bits per second (bps) or bytes per second. For analog devices, the *bandwidth* is expressed in cycles per second, or Hertz (Hz). The speed with which data can be transmitted from one device to another. Data rates are often measured in megabits (million bits) or megabytes (million bytes) per second.

d. What is the Use of Home location Register?

(1M)

Ans)

The Home Location Register (HLR) is the main database of permanent subscriber information for a mobile network. The HLR is an integral component of CDMA (code division multiple access), TDMA (time division multiple access), and GSM (Global System for Mobile communications) networks.

e. Define Handover. (1M)

Ans)

In cellular telecommunications, the terms *handover* or *handoff* refer to the process of transferring an ongoing call or data session from one channel connected to the core network to another channel.

f. What are the advantages of GEO satellites? (1M)

Ans)

Advantages and disadvantages of geostationary orbit satellites. Long path length, and hence losses when compared to LEO, or MEO. **Satellites** more costly to install in **GEO** in view of greater altitude.

g. What is a Broadcast Disk? (1M)

Ans)

Broadcast Disks exploits communication asymmetry by treating a **broadcast** stream of data that are repeatedly and cyclically transmitted as a storage device.

h. What is the functionality of Access Point? (1M)

Ans)

A wireless access point (WAP) is a networking hardware device that allows a Wi-Fi compliant device to connect to a wired network. The WAP usually connects to a router (via a wired network) as a standalone device, but it can also be an integral component of the router itself.

i. What is Care of Address? (1M)

Ans)

In care of address is a way to send a letter to a recipient who is temporarily staying somewhere else or receiving mail somewhere else.

j. What is Jitter? (1M)

Ans)

Jitter is simply the difference in packet delay. In other words, *jitter* is measuring time difference in packet inter-arrival

k. What is Explicit Congestion Notification? (1M)

Ans)

Explicit Congestion Notification (ECN) is an extension to the Internet Protocol and to the Transmission Control Protocol and is defined in RFC 3168 (2001).

l. Differentiate Push & Pull based Mechanism. (1M)

Ans)

Push-based mechanism: In which the data is pushed as per the subscription for a push service by a user.

Pull-based mechanism: In which a device pulls (demands) from a server (or) computing system.

UNIT-I

2a) Explain the problem of hidden and exposed terminals. 6M

Ans:

In wireless networking, the **hidden node problem** or **hidden terminal problem** occurs when a node is visible from a wireless access point (AP), but not from other nodes communicating with that AP. 1M

Exposed node problem. In wireless networks, the **exposed node problem** occurs when a node is prevented from sending packets to other nodes because of a neighboring transmitter. 1M

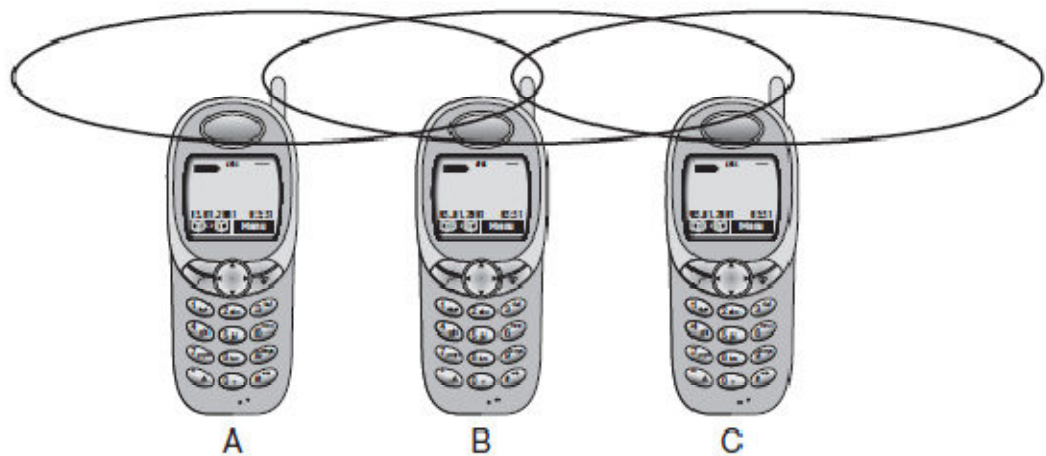
➤ Hidden terminals 1M

- A sends to B, C cannot receive A
- C wants to send to B, C senses a “free” medium (CS fails)
- collision at B, A cannot receive the collision (CD fails)
- A is “hidden” for C

➤ Exposed terminals 1M

- B sends to A, C wants to send to another terminal (not A or B)
- C has to wait, CS signals a medium in use
- but A is outside the radio range of C, therefore waiting is not necessary
- C is “exposed” to B

2M



2b) what limits the number of simultaneous users in a TDM/FDM System compared to a CDM system?

What happens to the transmission quality of connections if the load gets higher in a Cell, i.e., how does an additional user influence the other user in the cell. **6M**

Ans:

3M

- In TDM the channels per frame are finite; that limits the number of users. In FDM it is the bandwidth divided into channels of minimum bandwidth.
- In Code Division Multiplexing the number of codes of a particular length is finite and that limits the number of users.
- All these codes must possess 'randomness' as the property to be called a code. Cross-correlation of any pair of codes must be minimal to prevent one code breaking into another (code capture).
- In CDM for every channel the other code messages appear as noise. . if all possible users 'use' code, noise per channel rises.

What happens to the transmission quality of connections if the load gets higher in a Cell, i.e., how does an additional user influence the other user in the cell. **3M**

- In TDM/FDM systems, we have time slots on certain carrier sub-frequencies, which can be assigned to single users.
- When all slots on all carriers are assigned, no new users can be accepted – we have a fixed maximum number of users.
- Dynamics like re-assignment are not specified for these methods. Within CDM systems, we have dynamics integrated,
- Giving a soft limit of the number of users: just choose longer codes for a higher number of users. (With the disadvantage of lower data rates...) But: each new user increases the noise level for all other users; in contrast to TDM/FDM systems, user influence each other, and if the SNR becomes too bad, devices farer away fall out of reception range.

(OR)

3a) What are the main reasons for using cellular systems? How SDM is typically realized and combined with FDM? How does DCA influence the frequencies available in other-Cells? **6M**

Ans)

4M

- Higher capacity, higher number of the users: cellular systems can reuse spectrum according to certain patterns.
- Each cell can support a maximum number of users.
- Support user localization and location based services:
- Less transmission power needed.

- Smaller cells also allow for less transmission power (thus less radiation). The mobile systems can enjoy longer runtime.

How SDM is typically realized and combined with FDM? 1M

- Typically each cell holds a certain number of frequency bands. Neighboring cells are not allowed to use the same frequencies.

How does DCA influence the frequencies available in other-Cells? 1M

- Whether or not DCA depends on the current load. It can react upon sudden increase in traffic by borrowing capacity from other cells. However the “borrowed” frequency must then be blocked in neighboring cells.

3b) What are benefits of reservation schemes? How are collisions avoided during data transmission, why is the probability of collision lower compared to classical Aloha? What are disadvantages of reservation schemes? 6M

Ans: 2M

- After reservation of the medium succeeded no more collisions can occur (if the system is error free).
- Reservation schemes can also guarantee bandwidth, delay and maximum jitter. Thus, during the transmission nothing can happen.

How are collisions avoided during data transmission, why is the probability of collision lower compared to classical Aloha? 2M

- Compared to classical Aloha the collision probability is lower because the contention period is kept short compared to the contention-free period where transmission take place.

What are disadvantages of reservation schemes? 2M

- A disadvantage of reservation schemes is the latency for data transmission. Before terminals can start transmission they have to reserve the medium. This wastes time in case of a very lightly loaded medium.

UNIT-II

4a) 2G and 3G systems can both transfer data .Compare these approaches with DAB/DVB and list reasons for and against the use of DAB/DVB. 6M

Ans: 3M

- DAB and DVB both offer much higher data rates compared to 2G/3G networks.
- But they operate only unidirectional and bandwidth is shared (well, the capacity of a 2G/3G cell is shared, too).
- Thus, broadcast systems are good for distributing mass data relevant to many (in the best case all) users.

Compare these approaches with DAB/DVB and list reasons for and against the use of DAB/DVB. 3M

- Good examples are radio and TV, but also system updates, popular web content, news etc. Typically, it is too expensive to broadcast individual data. However, if broadcast bandwidth is available this is feasible, too. DAB/DVB can be complementary to 2G/3G systems.
- In particular if downloads are needed at higher relative speeds.
- Mobile phone systems have to lower their bandwidth dramatically at high speeds, while broadcast systems may still work at full bandwidth.

4b) What are the functions of authentication and encryption in GSM? How is system

Security maintained?

6M

Ans:

4M

- The first step is the authentication of the user against the SIM. This is done using a simple PIN. Then, the SIM authenticates itself against the GSM system.
- This second authentication is much stronger compared to the PIN. This is because the operator is not really interested in who is using the system as long as it is a valid and paying customer.
- Authentication with the system uses a challenge response scheme with a shared secret on the SIM and in the AuC.
- Neither the SIM nor the AuC will transmit this secret over the air or reveal it to customers. Encryption only takes place between the MS and the BSS.

How is system Security maintained?

2M

- GSM does not provide strong encryption end-to-end or MS to the gateway into the fixed network. System designers decided for over-the-air encryption only as they thought that the system itself is trustworthy.
- Thus, authentication of base stations against MSs was neglected, too. This opened ways to fake base stations.

(OR)

5a) Looking at the HLR/VLR database approach used in GSM-how does this architecture

Limit the scalability in terms of users, especially moving users.

6M

Ans:

3M

- GSM uses only two levels of hierarchy: Network operators store all user related information in the HLR and all information related to visitors within a certain location area in a VLR.

- Capacities of HLRs is up to some million customers, that of VLRs up to a million. I.e., within the location area a maximum of, e.g., one million users can be active (registered).
- If many users move between location areas updates have to take place, i.e., the HLR always gets the information about the new VLR.

How does this architecture limit the scalability in terms of users, especially moving users? **3M**

- These updates happen independently on the users' activity (data transmission, calls etc.). For standard scenarios – most users stay most of the time within their location area – the 2-level hierarchy works well.
- However, if, e.g., many tourists move frequently the updating process puts some load on the network as the HLR in the home network of the tourists always requires update information – probably around the globe.
- More levels of hierarchy could improve scalability but also raises complexity.

5b) Considered as an interworking unit in a communication network, what function can a Satellite have. **6M**

Ans:

4M

- Classical satellites were simple amplifiers that amplified the incoming analogue signal and transmitted it again on a different frequency.
- The next step came with digital signals. Satellite could then work as repeater.
- This includes regeneration of the digital data and transmission of signals representation the received data without noise (compared to analogue amplifiers that also amplify noise).
- Many of today's satellites are repeaters. The next steps are switches/routers.

What function can a Satellite have?

2M

- Satellites can perform data forwarding functions depending on receiver addresses and can even route data through space from satellite to satellite.

UNIT-III

6a) How do IEEE 802.11, HiperLAN2 and Bluetooth, respectively, solve the hidden terminal

problem?

6M

Ans:

3M

- 802.11 uses the MACA mechanism sending RTS/CTS to solve the hidden terminal problem.
- For HiperLAN2 this problem does not exist as the AP controls all medium access.
- If a terminal is hidden it cannot communicate at all and thus, does not interfere.

How solve the hidden terminal problem?

3M

- In Bluetooth, too, are no hidden terminals as the master controls all visible slaves.
- If a terminal does not see the master it cannot participate in communication.

- If this terminal sends anyway it will not interfere as this terminal then acts as master with a different hopping sequence.

6b) Show the steps required for a handover from one foreign agent to another foreign agent including layer 2 and layer 3. 6M

Ans:

- Even if you can do a handover with mobile IP, each handover starts on layer 2.
- Thus, first the usual procedure of scanning the medium, detecting other base stations, deciding on one of them, (make reservations, if allowed by the network,) reroute data inside the infrastructure network, release resources with the old base station.
- As soon as the registration with the new base station is done, we have to listen for agent advertisements to get a new COA from a new FA, start authentication, and inform the HA about the new address.
- In the meantime, lot of data are sent to the old base station;
- Here, the FA would have to buffer them to avoid a data loss.
- The new FA would inform the old one about the new device, the data transferred during handover is redirected.
- But – mobile IP in pure version is not able to keep the data transmitted during a handover. This usually is left over to layer 4.

(OR)

7a) What are advantages and problems of forwarding mechanisms in Bluetooth networks regarding security, power saving and network stability. 6M

Ans:

- Forwarding data in Bluetooth between piconets require a node jumping back and forth between these piconets.
- This also requires authentication in both networks, nodes that are (almost) always active and synchronous clocks if the master jumps into another piconet.
- If the master jumps away all network traffic in the piconet stops, all slaves have to wait until the master returns.
- All hopping sequences must stay synchronous during that time.
- Up to now not many devices are capable of forming scatter- nets with nodes jumping back and forth.

7b) Name the main difference between multi-hop ad-hoc networks and other networks. What advantages do these ad-hoc networks offer? 6M

Ans:

- Ad-hoc networks in general do not require an infrastructure to operate (they can be connected to an infrastructure).
- Multi-hop ad-hoc networks additionally do not require that all nodes can receive each other.
- Nodes may forward transmissions for other nodes.

- Advantages are the lower required transmission power (it's just like whispering into the neighbour's ear instead of shouting out loud) and the increased robustness (failure of single nodes can be tolerated).

UNIT-IV

8a) Can the problem using TCP be solved by replacing TCP with UDP? Where could this be useful and why is it quite often dangerous for network stability? 6M

Ans:

If only some users replaced TCP by UDP they might experience higher throughput.

- However, the missing congestion avoidance mechanisms would soon lead to huge packet loss in the Internet.
- Additionally, reliability has to be added as UDP does not guarantee packet transmission.
- A lot of research exist for TCP friendly protocols, reliable UDP etc.

8b) Name the advantages and disadvantages of user acknowledgements in WTP .What are typical applications for both cases. 6M

Ans:

Advantage: 3M

- Users can control the acknowledgement process, users may want to know if something went wrong,
- Sometimes it is also possible to slow down a sender by inserting artificial delays in the acknowledgement process, and the acknowledgement of a user is —stronger|| as it shows the sender that the intended receiver and not the WTP process actually got the message.

Disadvantages: 1M

- Users have to interact, this may take some more time.

What are typical applications for both cases? 2M

- Classical transactional services typically benefit from user acknowledgements, for most push service user acknowledgements are not necessary, still WTP acknowledgements can improve reliability.

(OR)

9a) Name further optimization of TCP regarding the protocol overhead which are important especially for narrow band connections .which problem may occur? 6M

Ans: 2M

Selective retransmission is always a good idea. Most of the other optimizations exhibit drawbacks:

- TCP acknowledgements are often cumulative
 - ACK n acknowledges correct and in-sequence receipt of packets up to n
 - if single packets are missing quite often a whole packet sequence beginning at the gap has to be retransmitted (go-back-n), thus wasting bandwidth
- Selective retransmission as one solution 2M
 - RFC2018 allows for acknowledgements of single packets, not only acknowledgements of in-sequence packet streams without gaps
 - sender can now retransmit only the missing packets
- Advantage 1M
 - much higher efficiency
- Disadvantage 1M
 - more complex software in a receiver, more buffer needed at the receiver

There is no single solution and even the standards/drafts are inconsistent with each other.

9b) Why has a scripting language been added to WML? How can this language help saving bandwidth and reducing delay? 6M

Ans: 2M

- Scripting can help to reduce traffic by checking input on the mobile device.
- Without scripting support the device must transfer all input for checking to a server.
- Furthermore, scripting can access many device functions.
- WMLScript (Wireless Markup Language Script) is the client-side scripting language of WML (Wireless Markup Language)
- A scripting language is similar to a programming language, but is of lighter weight. With WMLScript, the wireless device can do some of the processing and computation.

How can this language help saving bandwidth and reducing delay? 4M

- This reduces the number of requests and responses to/from the server. In the old days, fewer round-trips can improve the performance of your WAP site significantly since data transmission over wireless networks is slow.
- Today, the performance gained may not be so significant any more as data transmission speed has improved a lot. However, you may still find WMLScript useful since putting some operations at the client-side can reduce the load of your servers
- WMLScript is based on ECMAScript (European Computer Manufacturers Association Script), which is JavaScript's standardized version. So, the syntax of WMLScript is very similar to JavaScript.
- A major difference between JavaScript and WMLScript is that JavaScript code can be embedded in the HTML markup, whereas WMLScript code is always placed in a file separated from the WML markup.
- URLs are used to refer to the actual WMLScript code in the WML document
- WMLScript has a number of standard libraries. They contain a lot of useful functions
- One common use of WMLScript is to validate form data.

- Another common use is to display message boxes to give alerts and error messages or to ask for confirmation of actions

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