S-72.620 Short questions for closed book exam part

GENERAL

1. List n quality parameters for circuit switched connections in a cellular radio network.
    - Blocking probability
    - Call dropping probability
    - Signal outage probability
    - Interference outage probability
    - Transmission quality (BER/FER)
2. List 2 quality parameters for packet switched connections in a cellular radio network.
    - Throughput
    - Delay
3. List n starting points for cellular radio network planning.
    - System specification
    - Equipment specification
    - Existing infrastructure
    - Service area topography
    - Desired grade of service
    - Available frequency band
    - Traffic distribution
4. Which 3 objectives for cellular radio network planning are mentioned
    - To obtain sufficient coverage over the entire service area to ensure that high quality voice and data services with low error rates can be offered to the subscribers.
    - To give possibility to offer the subscriber traffic network capacity with sufficiently low blocking.
    - To enable an economical network implementation when the service is established and a controlled network expansion during the life cycle of the network.

CAPACITY PLANNING

5. Give a definition of the capacity of a cellular radio network.
   - Maximum number of ongoing calls/cell of calls/service area.
   - Offered traffic that can be served with a certain blocking probability. Blocking probability is a QoS requirement defined by the operator
   - Served traffic with a given blocking probability
   - Amount of transmitted data with given QoS requirement per time, bandwidth and service area unit.
6. List three factors that have an impact on the offered traffic in a cell.
   - Number of potential users and their distribution over the service area
   - Penetration factor.
   - Time of busy hour.
   - Subscriber behaviour
7. Which condition must the offered traffic fulfill to make the Erlang B-blocking model valid
   - Arriving calls are Poisson-distributed
   - Call duration is Exponentially-distributed
   - Blocked calls are dropped, no queuing.
8. Define the quantities in the Erlang B-blocking formula:

$$B = \frac{\frac{T^N}{N!}}{\sum_{n=0}^{N} \frac{T^n}{n!}}$$

   - B, blocking probability
   - T, offered traffic (Erlang)
   - N, number of traffic channels
9. What kind of cell shapes giving full coverage are used in theoretical radio network investigations.
   - Hexagonal structure

COVERAGE PLANNING

10. Which components are typically included in the base station antenna feeder system.
    - Cable
    - Connectors
    - Jumpers.
11. Which are two main approaches to the coverage planning problem.
    - Where to put the cell border to fulfill the coverage probability target with given radio link parameters.
    - How to choose the radio link parameters to fulfill the coverage probability target for a given cell size.
12. Name two average path loss models, give also the cellular environment where they are usable
    - Hata model, outdoor macrocells
    - Dual-slope mode, outdoor microcell
13. Explain with words which three terms constitute the COST231 Walfisch-Ikegami average path loss model.
    - Free space loss between MS and BS
    - Roof to street diffraction loss
    - Multiscreen diffraction over the roof between MS and BS

FREQUENCY PLANNING

14. Explain the term protection ratio of radio receiver
    - Average carrier to average interference power ratio still giving the required quality of service.
15. Explain the term interference outage
    - Interfering signals are stronger than protection ratio. This leads to degrading of the quality of service.
16. Explain the term frequency reuse factor
    - Frequency reuse factor defines the range after the same frequency can be used again.