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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -1 EXAMINATION- Sep 2018
B.Tech VII Semester

COURSE CODE: 10B1WEC731 MAX. MARKS:15
COURSE NAME: Mobile Communication
COURSE CREDITS: 4 MAX. TIME: One Hr

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q1) **(3)**

A mobile communication system is allocated a RF spectrum of 25 MHz and uses RF channel bandwidth of 25 KHz so that a total number of 1000 voice channels can be supported in the system.

a) *If the service area is divided into 20 cells with a a frequency reuse factor of 4 , compute the system capacity.*
b) *The cell size is reduced to the extent that the service area is now covered with 100 cells . compute the system capacity while keeping the frequency reuse factor as 4.*
c) *Consider the cell size is further reduced so that the same service area is now covered with 700 cells with frequency reuse factor of 7. Compute the system capacity.*

Comment on the results obtained.

Q2) **(3)**

A geographical area of 3000 km^2 is covered by a cellular system using a seven cell hexagonal reuse pattern, with each cell having a radius of 6 Km. The system is allocated 40 MHz of spectrum with a full duplex channel bandwidth of 60 KHz. Assuming a blocking probability of 2% is specified for Erlang B system, compute

a) *The number of cells in the service area and the number of channels per cell.*
b) *The theoretical maximum number of users that could be served at one time by the system.*
c) *Traffic Intensity of each cell.*
d) *The maximum carried traffic.*
e) *The total number of users if the offered traffic per user is 0.03 Erlangs*
f) *The number of users per channel(considering channel reuse)*

Q3) **(3)**

In an analog FDMA cellular system, the allocated system bandwidth is 12.5 Mhz, the channel spacing is 30 KHz, and the guard spacing at each edge of the allocated system bandwidth is 10 KHz. The number of channels allocated for control signaling is 21, determine the following:

a) *The number of channels available for user data transmission per cluster*
b) *The number of channels available for user data transmission per cell if the cluster size or frequency reuse factor is 7.*
c) *The overall system spectral efficiency in units of channels/MHz/Km^2, assuming the cell area as 6 Km^2.*

Q4) **(3)**

Illustrate and prove that for a regular hexagonal geometry, the cell cluster size is given by the relationship

$$K = i^2 + j^2 + I + j.$$

Q5) *A company with 200 employees was provided with wireless public phone service with eight lines. Each employee on an average makes a three minute telephone call every two hours. Calculate (a) Traffic Load. (b) The Blocking probability. Assume Erlang B is used.* **(3)**