Birla Institute of Technology & Science, Pilani, Rajasthan
Second Semester 2017-2018
Mid Sem Test

Course no: EEE G 592 **M.M.: 60**
Course title: Mobile Personal Communication **Weightage: 30%**
Date: 06-03-2018

(Open Book) **Marks: 60** **Duration: 90 minutes**

Q.1: A cellular operator obtains 10MHz bandwidth around 900 MHz frequency band and develops an AMPS based mobile telecommunication network keeping 5% channels reserved for control purpose to serve a city of an area of 3200 $km^2$and maintains a S/I as 14dB with omnidirectional antenna . The system is designed for a Erlang B traffic with a 5% GOS when the average traffic offered by an individual user with average call duration of 5 minutes and call frequency 2 time per day. The average power at the cell boundary is measured as -48dBm with a standard deviation of 8dB. In the system the maximum speed allowed for the user is 144kmph and needs critical duration for handoff of 1 minute to provide a a handoff margin of 5.2 dB. [P_0(100m)= 10W]

i. Find the co-channel antenna separation and number of cell cluster repeated in the city.
ii. Find the number of served customers in the city.
iii. Probability that the power at the cell boundary is more than -55dBm and corresponding percentage usable area.
iv. If the cell uses 120 ^{0} sectored antenna the number of users per cell without changing reuse factor.
v. Level crossing rate if the specified received voltage is 80% of the local rms value for a channel at 900 MHz..
vi. Average fade duration and BER for a 12 kbps system for the signal condition of case (v).

(6x5)

Q.2: In a knife edge diffraction model a receiver of height of 5 m receives at 1000 MHz signal form a 50m high BS situated at 15 km and measures a 6dB diffraction loss when obstructed by a 20 m high structure lying in the path .

(i) Find the diffraction loss at the receiver location if the receiver hight is 1 m and also 10m.
(ii) Find radius of the first Fresnel Zone.
(iii) Estimate the diffraction loss if the carrier frequency is reduced to one fourthfor both the cases af receiver heights. (5x3)

Q.3: (a) Explain importance of channel modeling in a cellular system . How coherence time and coherence bandwidth of a wireless channel are estimated and what important information can be concluded for wireless communication, discuss in brief with specific numerical examples for all the cases?
(b) Explain the concept of overlay concept of channel bandwidth splitting to enhance the capacity of a cellular system with a specific numerical example for both the cases mentioning the required conditions.

(9+6)

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