Registration no: | | | | | | | | | | |

Total Number of Pages: 02

M.TECH
ETPC 201

Second Semester Mtech Regular / Back Examination – 2014-15
Wireless Communication
Branch: COMMUNICATION SYSTEMS/ELECTRONICS AND COMMUINCATION / ELECTRONICS AND COMMUNICATION ENGINEERING / ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Time: 3 Hours
Max marks: 70
Q. Code:T220

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

The students should be provided with Erlang B and Erlang C charts.

Q1 Answer the following questions: (2 x 10)

a) Do you use frequency reuse in any communication systems other than the cellular system? Explain.
b) Bring out two important differences between a wired channel and a wireless channel.
c) State the reasons for the use of hexagonal cells in a wireless system plan layout.
d) What are the interferences experienced in a typical cellular system? How are they different?
e) What is the value of the reflection coefficient when an EM wave is incident at a perfect conductor? Justify.
f) What are the functionalities of a MAC layer?
g) What is short term fading? What is 'short' here?
h) Express 10 W of power in dBm. Show the relation between dB and dBm.
i) What is a multipath effect? What does it do to a signal?
j) Calculate the free space path loss in dB when a transmitter sends 1 kW of power to a receiver at a distance of 1 km.

Q2 a) A bandwidth of 20 MHz is allocated for a duplex wireless cellular system and each simplex channel has 25kHz RF bandwidth. Find (i) the number of duplex channels and (ii) the total number of channels per cell site for $N = 7$. (2+3)

b) Derive an expression for the signal to co channel interference power ratio considering only the first layer of interfering cells. Draw a neat sketch with proper labels to do your derivation. (3+2)

Q3 a) A cellular system uses $N = 7$. It is operated with 660 channels, 30 of (5)

which are used as control channels. A potential user density of 9000 users/km^2 exists in the system. Each user makes an average of one call per hour and each call lasts 1 minute during peak hours. Determine the probability that a user will experience a delay greater than 20 seconds of all calls queued.

b) What is the maximum system capacity (total and per channel) in Erlangs when providing a 2% blocking probability with four channels, with 20 channels and 40 channels. (5)

Q4 Derive the Brewster angle for parallel polarization. State the standard assumptions you have made here. (10)

Q5 a) Derive the CDF of the Rayleigh distributed random variable. Sketch it. Hence derive the variance of such a random variable. (5)

b) Develop an appropriate expression for the E-field at a mobile input assuming Clarke's model for flat fading. Show your steps clearly. (5)

Q6 a) Suggest a suitable circuit to generate a PNS of length 15. Sketch the appropriate circuit to take care of the all-zero state. (2+3)

b) Calculate all the possible normalized autocorrelation values for a length 7 PNS. Sketch this autocorrelation function. (5)

Q7 a) Outline a procedure for developing the pdf of the fading power when fading is modeled as a Rayleigh distributed random variable. Sketch it. (6)

b) Derive an expression for the throughput of a slotted ALOHA method. What are the standard assumptions? (5)

Q8 Write short notes on any two: (5 x 2)

a) Zero forcing equalizer
b) Polarization diversity
c) GSM speech encoder
d) IEEE 802.11 standard