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ROLL NO.								

B.E./B.TECH (FULL TIME) DEGREE ARREAR EXAMINATIONS, NOVEMBER/DECEMBER 2012

ELECTRONICS AND COMMUNICATION ENGINEERING

SIXTH SEMESTER REGULATIONS: R-2008

EC 9352 – WIRELESS COMMUNICATION

Time: 3 Hours **Answer ALL Questions** **Max.Marks: 100**

Part-A (10x2=20 Marks)

1. Distinguish flat fading and frequency selective fading.
2. What is meant by coherence time and coherence bandwidth?
3. What is meant by Grade Of Service (GOS)?
4. Prove that for a hexagonal geometry, the co-channel reuse ratio is given by Q = $\sqrt{3N}$, where $N = i^2 + ij + j^2$.
5. Define power efficiency and spectral efficiency.
6. Mention the importance of cyclic prefix in OFDM system.
7. Differentiate spatial diversity and spatial multiplexing.
8. Assume four branch diversity is used, where each branch receives an independent Rayleigh fading signal. If the average SNR is 20 dB, determine the probability that the SNR will drop below 10 dB. Compare this with the case of a single receiver without diversity.
9. If a US AMPS cellular operator is allocated 12.5 MHz for each simplex band, and if B_t is 12.5 MHz, B_{guard} is 10 kHz, and B_c is 30 kHz, find the number of channels available in an FDMA system.
10. If GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel, find the time duration of a frame and how long must a user occupying a single time slot wait between two successive transmissions.

Part-B (5x16=80 Marks)

11.(i) A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal-to-interference ratio of 15 dB in the worst case. Find the optimal value of N for (a) omnidirectional antennas, (b) 120^0 sectoring, and (c) 60^0 sectoring. should sectoring be used? if so, which case (60^0 or 120^0) should be used? (Assume a path loss exponent of n = 4 and consider trunking efficiency). **(6)**

(ii) Explain the various capacity expansion techniques. **(10)**

12.(a)(i) Derive the expression of the received power of a distance 'd' from the transmitter for the two-ray ground reflection model. **(8)**

(ii) A mobile is located 5 km away from a base station and uses a vertical λ/4 monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. (a) Find the length and the effective aperture of the receiving antenna. (b) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above ground. **(8)**

OR

12.(b)(i) Derive and explain the impulse response model of a multipath channel. **(8)**

(ii) Assume a mobile traveling at a velocity of 10 m/s receives two multipath components at a carrier frequency of 1000 MHz. The first component is assumed to arrive at $\tau = 0$ with an initial phase of 0^0 and a power of -70dBm, and the second component which is 3 dB weaker than the first component is assumed to arrive at $\tau = 1$ μs, also with an initial phase of 0^0. If the mobile moves directly toward the direction of arrival of the first component and directly away from the direction of arrival of the second component, compute the narrowband instantaneous power at time intervals of 0.1 s from 0 s to 0.5 s. Compute the average narrowband power received over this observation interval. Compare average narrowband and wideband received powers over the interval, assuming the amplitudes of the two multipath components do not fade over the local area. **(8)**

13.(a) With neat block diagram, explain the QPSK, OQPSK and π/4 QPSK and compare their features. **(16)**

OR

13.(b)(i) With neat diagram, explain the GMSK transmitter and receiver. **(8)**

(ii) With suitable diagram, explain the OFDM transmitter and receiver. **(8)**

14.(a) Explain the various diversity and combing techniques. **(16)**

OR

14.(b)(i) With neat block diagram, explain the Rake receiver. **(8)**

(ii) Derive the expression for the capacity in fading and non-fading channels of a MIMO system. **(8)**

15.(a)(i) Explain the Direct Sequence Spread Spectrum and Frequency Hopping Spread Spectrum. **(8)**

(ii) With suitable example, compare the features of TDMA, FDMA and CDMA. **(8)**

OR

15.(b) With neat diagram, explain the reference architecture of GPRS. **(16)**
