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Total number of printed pages – 3

B. Tech
PEEC 5302

Sixth Semester Back Examination – 2015

MOBILE COMMUNICATION

BRANCH (S) : EC, ETC

QUESTION CODE : M 403

Full Marks – 70

Time : 3 Hours

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



1. Answer the following questions : 2×10
- Consider the AMPS system, in which an SIR of 18 dB is required for the accepted voice quality. If the path loss exponent is 4, then determine the reuse factor for the system.
 - What do you mean by segmentation in the context of cellular communication ?
 - Write the full form of the following: PDC, ISDN, CDPD, IS 95
 - Under which condition, the Rician distribution can be used to characterize the small scale fading in the context of radio wave propagation ?
 - Differentiate between TDMA and FDMA schemes.
 - Draw the signal space diagram for QPSK.
 - A modulator transmits symbols at a rate of 19,200 symbols per second. Each symbol has 64 different possible states. What is the bit rate ?
 - In a first-generation AMP system where there are 395 channels of 30 kHz each in a bandwidth of 12.5 MHz, what is the multiple access spectral efficiency for FDMA ?
 - What do you mean by channel equalization ?
 - What are the requirements of DSSS ?

P.T.O.

2. (a) In the IS-54 (TDMA/FDD), the frame duration is 40 ms. The frame contains six time slots. The transmit bit rate is 48.6 kbps. Each time slot carries 260 bits of user information. The total number of 30 kHz voice channels available is 395 and the total system bandwidth is 12.5 MHz. Calculate the access efficiency of the system. 5

(b) Calculate the capacity and spectral efficiency of the DS-SSMA system with an omnidirectional cell using the following data : 5

bandwidth efficiency = 0.9

frequency reuse efficiency = 0.45

capacity degradation factor = 0.8

voice activity factor = 0.4

information bit rate = 16.2 kbps

$E_b/I_0 = 7$ dB

one-way system bandwidth $B_w = 12.5$ MHz.

Neglect other sources of interference.



3. Discuss about the evolution of cellular communication. Give a comparison between 1G, 2G, 2.5G, 3G, 3.5G cellular systems. 10

4. (a) Prove that the cluster size $N = i^2 + j^2 + ij$, where the variables are having their usual meaning. 5

(b) Consider a GSM system with a one-way spectrum of 12.5 MHz and channel spacing of 200 kHz. There are three control channels per cell, and the reuse factor is 4. Assuming an omnidirectional antenna with six interferers in the first tier and a slope of path loss of 40 dB/decade, calculate the number of calls per hour per cell site with 2% blocking during the system busy hour and an average call holding time of 120 seconds. The GSM uses eight voice channels per RF channel. (for 122 channels with 2% blocking, traffic load is 110 Erlangs) 5

5. (a) Describe a FH-SS transmitter and receiver with suitable diagram. What is spread in this system ? 6
- (b) Write a short notes on multiple access schemes. 4
6. (a) Derive the expression of received power using the path loss over a reflecting surface. 6
- (b) Discuss about the basic propagation mechanisms in a wireless medium. 4
7. (a) What do you mean by co-channel interference ? Discuss about the causes and consequences of CCI. Explain the methods used to avoid the co-channel interference. 5
- (b) If $M = 8$, $f_c = 250$ kHz, $\Delta f = 25$ kHz, what is the total bandwidth required ? What is the bandwidth efficiency ? What is the E_b/N_0 required for symbol bit error probability 10^{-6} of a coherent MFSK ? How many bits per symbol are carried ? Symbols are having their usual meaning. 5
8. Write short notes any **two** of the following : 5x2
- (a) Multicarrier DS-CDMA
- (b) Adjacent Channel Interference
- (c) Quadrature Amplitude Modulation
- (d) Okumura/ Hata Model.