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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(R), MAY 2024

B. Tech. Electronics and Communication Engineering

(2020 SCHEME)

Course Code : 20ECT402

Course Name : Wireless Communication

Max. Marks : 100 **Duration:3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. What are the key features of 3G systems
2. How does frequency reuse help in increasing the capacity of a cellular network?
3. Describe ground wave propogation . Also give the frequency range of groundwave propogation.
4. Derive the relationship between maximum usable frequency and critical frequency
5. Explain excess delay and rms delay spread?
6. Illustrate the relation between the various multipath parameters and the type of fading experienced by the signal in a matrix format.
7. Explain the concept of overlapping subchannels in wireless communication.
8. What is the average error probability of a BPSK system in flat fading channels?
9. Compare zero - forcing equalizer and minimum mean squared error equalizer.
10. Differentiate between microdiversity and macrodiversity.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. A hexagonal cell within a 4-cell system has a radius of 1.387km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs and $\lambda = 1$ call hour. Compute the following for an Erlang C system that has a 5% probability of a delayed cell.(From Erlang C Traffic Table ,total number of traffic generated by a system for GoS of 5% and No of channels 15 is 9.044) 14
    a) How many users per square kilometer will this system supports?
    b) What is the probability that a cell will have to wait for more than 10s ?
    c) What is the probability that a cell will be delayed for more than 10s?

OR

12. What are the methods for improving coverage and capacity in cellular systems 14

MODULE II

13. a. A television transmitter antenna mounted at a height of 200 meters and the receiving antenna has a height of 20 meters . What is the maximum spacing between the transmitter and receiver through troposheric propogation ? Also compute the radio horizon. 14

b. Derive the expression for critical , maximum usable frequency and skip distance for skywave propogation.

OR

14. a. It is decided to establish a secure communication link between 2 stations on the earth by reflection of waves from F layer with effective height 300km and electron density $6x10^5$ electron/ m^3. Calculate the angle taken by transmitter beam if the distance between the two stations is 1200km. What is the maximum usable frequency of transmitter? (Assume the earth's surafce to be flat) 7

b. Describe the various ionospheric abnormalities. 7

MODULE III

15. What is the importance of two ray model? Derive the expression for pathloss in a two ray ground reflection model. 14

OR

16. Consider a wireless channel where power fall off with distance follows the formulae $P_r(d) = P_t(d_0/d)^3$ with d_0 = 10m. Assume the channel has Bandwidth of 30kHz and AWGN with noise power spectral density of $N_0 = 10^{-9}$ W/Hz. For a transmitted power of 1 Watts, Find the capacity of this channel for a transmitter - receiver distance of 100 m and 1 Km. 14

MODULE IV

17. Derive the expression for outgage probablitiy and average probability of error in BPSK system under Rayleigh flat fading. 14

OR

18. How discrete implementation of multicarrier is achieved 14

MODULE V

19. a.Compare Time Division Multiple Access and Frequency Division Multiple Access. 7

b. Describe the Principle of Selection Combining diversity technique. 7

OR

20. What are the various multiple access technologies used in Wireless communication ? 14

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