INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech V SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2022
Regulation:UG20
WIRELESS COMMUNICATION AND NETWORKS

Time: 3 Hours   (ELECTRONICS AND COMMUNICATION ENGINEERING)   **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Discuss different techniques used for improving coverage and capacity in cellular systems.
   [BL: Understand| CO: 1|Marks: 7]

   (b) If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses

   i) 4-cell reuse, ii) 7-cell reuse iii) 12-cell reuse   [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Obtain the expression for path difference and phase difference for a free space propagation model.
   [BL: Understand| CO: 2|Marks: 7]

   (b) If a transmitter produces 50 watts of power, express the transmit power in units of dBm and dBW. If 50 watts is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from the antenna. What is the received power at 10 km? Assume unity gain for the receiver antenna.   [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) What is meant by small scale fading? Identify the factors influencing the small scale fading.
   [BL: Understand| CO: 3|Marks: 7]

   (b) Consider a transmitter which reads a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving at 60 mph, compute the received carrier frequency if the mobile is moving

   i) Directly towards the transmitter

   ii) Directly away from the transmitter

   iii) In a direction which is perpendicular to the direction of arrival of the transmitted signal.
   [BL: Apply| CO: 3|Marks: 7]

4. (a) Explain a frequency domain channel impulse response measurement system with a neat diagram.
   [BL: Understand| CO: 4|Marks: 7]

(b) Calculate the mean excess delay, rms delay spread, and the maximum excess delay (10 dB) for the multi path profile given in the Figure 1. Estimate the 50% coherence bandwidth of the channel. Would this channel be suitable for GSM service ?   [BL: Apply| CO: 4|Marks: 7]
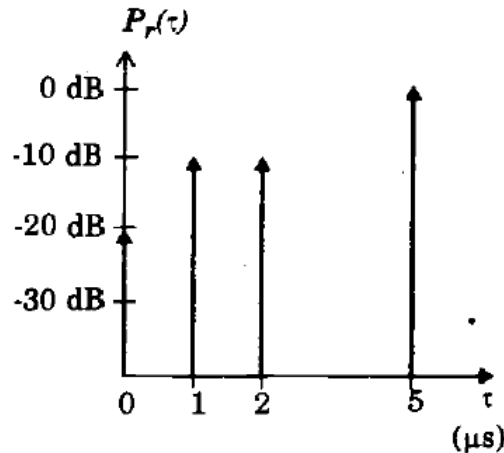

Figure 1

MODULE – IV

5. (a) Explain a decision feedback equalization (DFE) and maximum likelihood sequence estimation (MLSE) with the necessary details.   [BL: Understand| CO: 5|Marks: 7]

   (b) Construct the block diagram of an Mbranch rake receiver implementation. Explain polarization diversity with example.   [BL: Apply| CO: 5|Marks: 7]

6. (a) Mention the characteristics of recursive least squares algorithm. Explain about time diversity and frequency diversity methods.   [BL: Understand| CO: 5|Marks: 7]

   (b) 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. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) List the advantages of WLAN. Discuss the essential features of IEEE 802.11 MAC frame with the diagram.   [BL: Understand| CO: 6|Marks: 7]

   (b) Draw the configuration of IEEE802.11 architecture. Explain the physical layer specications of IEEE802.11 using infrared.   [BL: Apply| CO: 6|Marks: 7]

8. (a) Outline HiperLAN with the necessary diagrams. When does a WLAN become a personal area network (PAN)? Explain   [BL: Understand| CO: 6|Marks: 7]

   (b) Write about HiperLAN WLL. Compare and contrast IEEE 802.11 a, b, g and n standards.   [BL: Apply| CO: 6|Marks: 7]

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