OR

Calculate the nearest neighbour union bound for Gray-coded 16-QAM. Assuming that the BER must not exceed 10^{-5}, what are the useful ranges of E_b/N_0 for adaptive switching between the two modulation schemes namely; QPSK and 16-QAM for maximum achievable data rate.

Unit - V

5. a) Define correlation coefficient between the signals on different diversity branches. What is the value of correlation coefficient between the signals on two independent diversity branches?

   b) Differentiate between microdiversity and macrodiversity.

   c) What is adaptive equalization? When is it used?

   d) Explain the principle of combining diversity and explain the different combining diversity techniques.

OR

State the main advantage and disadvantage of blind equalization and name three approaches to designing blind equalizers.

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Total No. of Questions :5] *[Total No. of Printed Pages :4*

Roll No .....

EC - 7011

B.E. VII Semester

Examination, December 2015

Wireless Communication

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit-I

1. a) List the requirements for the services of the wireless communications?

   b) What are the various technical challenges in wireless communications?

   c) What is reflection? Explain in detail the reflection from dielectric.

   d) Does the carrier frequency of a system have an impact on

      i) Small-scale fading

      ii) Shadowing

   When moving over a distance x, will the variations in the received signal power be greater for low frequencies or high frequencies? Why?

OR

When communicating with a geostationary satellite from earth, the distance between TX and RX is approximately 36,000 km. Assume that Frii's law for free-space loss is applicable (ignore any effects from the atmosphere) and that stations have parabolic antennas with gains 60dB (Earth) and 20dB (satellite), respectively, at the 11 GHz carrier frequency used

i) Draw the link budget between transmitted power P_{TX} and received power P_{RX}.

ii) If the satellite RX requires a minimum received power of –120 dBm, transmit power is required at the earth station antenna?

Unit-II

2. a) Differentiate between small scale and large scale fading.

b) Define average level crossing rate and average fade duration.

c) What is dispersive channel? What are the factors that cause delay dispersion in a wireless channel?

d) Describe the tapped delay line models which can be used to represent WSSUS channel.

OR

Prove that in the 2-ray ground reflected model, the path difference is approximately equal to $\frac{2h_t h_r}{d}$, where h_t and h_r are the heights of transmit and receive antennas, respectively, and d is the distance between the transmitter and the receiver. Show when this holds as a good approximation.

Unit- III

3. a) What are the main applications for the channel models?

b) State the importance of channel sounding.

c) Consider a helical antenna with d=5mm operating at 1.9 GHz. Calculate the diameter D such that polarization becomes circular.

d) As the wireless propagation channel may be treated as a linear system, why are m-sequences (PN-sequences) used for channel sounding? Elaborate.

OR

Let the transmit antenna be a vertical $\lambda/2$ dipole, and the receive antenna a vertical $\lambda/20$ dipole.

i) What are the radiation resistances at TX and RX?

ii) Assuming ohmic losses due to $R_{ohmic} = 10\ \Omega$, what is the radiation efficiency?

Unit - IV

4. a) Draw the schematic diagram block diagram of a transmitter for wireless communication.

b) State clearly the assumptions made in deriving the structure of the optimum receivers for digital modulation.

c) Explain why the BER decreases approximately exponentially as the SNR increases in an AWGN channel whereas in a fading channel the BER decreases only linearly with the (average) SNR.

d) A system should transmit as high a data rate as possible within a 1-MHz band width, where out-of-band emissions of –50 dBm are admissible. The transmit power used is 20 W. Is it better to use MSK or BPSK with root-raised cosine filters with $\alpha = 0.35$? Justify your answer.