



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; Dec. - 2019

Fundamentals of Wireless Communication

Time: 3 hrs

Max. Marks: 100

Note: Answer *FIVE* full questions, selecting *ONE* full question from each unit.

UNIT - I

- 1 a. Briefly explain the following terms: 8
- i) Foot Print ii) Mobile equipment iii) Half duplex iv) Page
- b. With the help of a diagram, explain wire line (PSTN) to mobile (cellular) call procedures. 8
- c. With diagram, define hard handoff and soft handoff. 4
- 2 a. With a neat diagram, explain a first generation cellular radio network. 8
- b. Describe the paging system with the aid of block diagram. 6
- c. List the differences between wireless and fixed telephone networks. 6

UNIT - II

- 3 a. List and define the different steps involved in handoff procedure. 4
- b. Derive an equation for signal to interference noise ratio in terms of i_s and N . 8
- c. If a total 50 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 20 kHz simplex channel to provide full duplex voice and control channels. Calculate the number of channel available per cell if a system uses, 8
- i) 3 cell reuse ii) 6 cell reuse
- 4 a. Explain Lee's Microcell Zone concept with the neat diagram. 6
- b. Compare the channel assignment strategies. 7
- c. If a signal-to-interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (i) $n = 4$, (ii) $n = 3$? Assume that there are six co-channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. 7

UNIT - III

- 5 a. Briefly explain the free space propagation model with related equations. 10
- b. Assume a receiver is located 10 km from a 50 W transmitter. The carrier frequency is 900 MHz, free space propagation is assumed, $G_t = 1, G_r = 2$, find; 6
- i) The power at the receiver
- ii) The magnitude of the E-field at the receiver antenna
- iii) The rms voltage applied to the receiver input assuming that the receiver antenna has a purely real impedance of 50Ω and is matched to the receiver

- c. If a transmitter produces 50 W of power, express the transmit power in units of,
 i) dBm ii) dBW 4
 If 50 W is applied to a unity gain antenna with a 900 MHz carrier frequency.
- 6 a. Briefly explain factors influencing small scale fading. 8
- b. Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, compute the received carrier frequency if the mobile is moving;
 i) Directly towards the transmitter 6
 ii) Directly away from the transmitter
 iii) In a direction which is perpendicular to the direction of arrival of the transmitted signal
- c. A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ 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. Find; 6
 i) The length and the effective aperture of the receiving antenna
 ii) The received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and receiving antenna is 1.5 m above ground

UNIT - IV

- 7 a. Briefly discuss the modulation process in forward CDMA channel with a neat block diagram. 10
 b. Explain the five functional entities of DECT system with a neat block diagram. 10
- 8 a. Write the functional architecture of GSM system and explain. 10
 b. List and explain the Common Control Channels (CCCH) of GSM system. 6
 c. Illustrate GSM frame structure. 4

UNIT - V

- 9 a. Differentiate between circuit and packet switching in traffic routing. 6
 b. Write packet data format and briefly explain each field. 4
 c. Explain SS7 protocol architecture with a neat block diagram. 10
- 10 a. Describe the cellular digital packet data network with the help of block diagram. 10
 b. Explain the feature and functional blocks of an integrated services digital network with the help of diagram. 10

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