

2014

**B.E. (Electrical and Electronics Engineering)
Eighth Semester
EE-809: Wireless Communication**

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

- Q1a) What is the difference between IEEE 802.11a and IEEE 802.16 standard? (2 Marks)
- b) What does delay spread indicate about the characteristics of the fading channel? (2 Marks)
- c) A cellular network uses a hexagonal cell layout, where each cell has a radius of 1.5 km. If the total area covered by the network is 2000 km², how many cells are needed to cover the entire area? (2 Marks)
- d) What is the difference between physical and logical channels in GSM? List down various logical channels used by GSM system? (2Marks)
- e) What do you understand by SS7 signalling? What are the three kinds of signalling points in SS7 network? (2 Marks)

Part-A

- Q2a) What are some of the key features and benefits of 5G network technology? What are the technical specifications of 5G in India? (5 Marks)
- b) A cellular network has two cells, each operating on the same frequency channel with a transmit power of 20 watts. The cells are separated by a distance of 1 km. If the receive power threshold for cochannel interference is 10 μ W and the path loss exponent is 4, what is the maximum distance that a mobile station can be from its serving cell to avoid cochannel interference? (5Marks)
- Q 3a) A cellular network has a cell radius of 10 km and a total frequency spectrum of 60 MHz. Each channel has a bandwidth of 200 kHz and a reuse factor of 4. The maximum cell capacity is 100 users per channel. If the average call duration is 2 minutes and the average user generates 0.5 Erlangs of traffic, what is the maximum number of simultaneous users that can be supported in each cell, and what is the total traffic carrying capacity of the network? (5 Marks)
- b) What role does UTRAN play in 3G and 4G networks, and how has it evolved over time? What is the current version of UTRAN, and what improvements does it offer over earlier versions? (5 Marks)
- Q 4 a) Consider a QPSK and an OQPSK signal with the same bit rate and carrier frequency. Sketch the corresponding constellation diagrams for both signals. Describe the differences between the two diagrams and explain why OQPSK is sometimes preferred over QPSK in certain applications. (5 Marks)
- b) Explain the difference between fast fading and slow fading, and discuss how they affect the wireless communication system differently. Calculate the Doppler spread of the fast fading component assuming a maximum speed of 100 km/h and a carrier frequency of 2 GHz.

(5 Marks)

P.T.O.

(2)

Part-B

Q5a) How does space diversity improve wireless communication, and what are the different types of space diversity? What are the key components of a rake receiver, and how do they work together to extract the signal from a multipath channel? (5 Marks)

b) What is the function of the common control channel (CCCH) in GSM, and how is it used for signaling? How is the broadcast control channel (BCCH) used in GSM, and what information does it transmit? (5 Marks)

Q6 a) What are the different spreading codes used in forward and reverse CDMA, and how are they generated? How does forward CDMA differ from reverse CDMA in terms of system design and implementation?(5 Marks)

b) Describe the three basic categories of multiple access protocols: TDMA, FDMA, and CDMA. How are these protocols different from each other?

(5 Marks)

Q7a) Suppose you have a (7, 4) binary linear block code with a generator matrix

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$$

(i) What is the code rate of this block code?

(ii) What is the parity check matrix for this block code?

(iii) Encode the message "1011" using this code.

(iv) Suppose the received codeword is "1110011". Is there an error in the transmission? If so, correct the error and decode the message. (5 Marks)

b) What is the role of a training sequence in adaptive equalizers? How can it be used to estimate the channel response? Provide an example where a nonlinear adaptive equalizer is more suitable?

(5 Marks)

x-x-x