

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code : 80534**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Sixth Semester

Electronics and Communication Engineering

EC 8652 — WIRELESS COMMUNICATION

(Common to Computer and Communication Engineering/Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Link Budget.
2. Consider a base station transmitter operating at 900 MHz carrier frequency. For a mobile moving at a speed of 72 km/h, determine the Doppler shift.
3. Differentiate Hard and Soft Handoff.
4. How does sectoring help in reducing interference in cellular networks?
5. What do you mean by Bandwidth efficiency?
6. Why is high PAPR a challenge in OFDM systems?
7. Mention the necessary conditions for achieving diversity gain in a wireless communication system with frequency and time diversity.
8. What is the role of the error signal in the LMS algorithm?
9. Mention the purpose of using precoding in MIMO scenarios.
10. What is the need for Perfect channel State Information?

PART B — (5 × 13 = 65 marks)

11. (a) Prove that for a two-ray ground reflected model, Electric field strength is  $E_{TOT} = k/d^2$ , where  $k$  is a constant related to  $E_0$  and  $d$  is the distance over a flat earth between bases of the transmitter and receiver antennas.

Or

- (b) Describe how delay spread and Doppler spread play a role in determining the channel bandwidth required for a communication system.

12. (a) Compare and contrast TDMA with CDMA multiple access technique. Explain its advantages and limitations.

Or

- (b) Explain the various methods used in cellular systems to improve the capacity and coverage of the system.

13. (a) (i) Compare the performance of various QPSK modem architecture. (5)  
(ii) Explain the working of QPSK transmitter architecture commonly used in cellular systems. (8)

Or

- (b) (i) Explain the need for multicarrier modulation. (5)  
(ii) Describe the OFDM multicarrier transmission system with a neat block diagram. (8)

14. (a) (i) How does nonlinear equalization differ from linear equalization? (5)  
(ii) With neat Block diagram, explain about any one Nonlinear Equalizer. (8)

Or

- (b) (i) Explain why maximal ratio combining gives the best performance. (3)  
(ii) How does diversity improve the performance of radio system with respect to BER? (10)

15. (a) (i) With system model, explain about MIMO spatial multiplexing. (8)  
(ii) How is spatial multiplexing different from spatial diversity in MIMO systems? (5)

Or

- (b) (i) Analyze the capacity of Time-Invariant and time varying frequency selective fading channels. (8)  
(ii) Find the optimal power allocation policy for these channels. (5)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Analyze the multipath propagation effects in the context of frequency-selective fading. (7)
- (ii) Consider a wireless channel model with two paths as LOS and reflected paths. The signal is transmitted at carrier frequency  $f_c$  as 1 GHz, signal bandwidth 1 MHz, velocity of the mobile receiver as 64 km/hr. Verify whether the channel is fast fading or slow fading, if the delay requirement is 200  $\mu s$ . (8)

Or

- (b) (i) Assume that  $\theta_0 = 0^\circ$ . The bit stream 0 0 1 0 1 1 is to be sent using  $\pi/4$  DQPSK. The left most bits are first applied to the transmitter. Determine the phases of  $\theta_k$ . (7)
- (ii) Analyze the advantages of using GMSK modulation in digital cellular communication systems. (8)