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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
 [AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
 Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60008

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025

Third Semester

Information Technology

P23ITE20 – MOBILE NETWORK SYSTEMS

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 – Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	How does multipath propagation occur in wireless systems?	2	K1	CO1
2.	Compare Microcell, Picocell, and Macrocell.	2	K2	CO1
3.	Define frequency-selective fading.	2	K1	CO2
4.	Which is the main cause of path loss in outdoor channels?	2	K2	CO2
5.	Evaluate the power efficiency of a DSB-SC signal if the carrier power is 100 W and the message signal has a modulation index of 0.5?	2	K2	CO3
6.	A linear equalizer reduces ISI for a 4-symbol channel with impulse response $h=[1,0.5,0.2]$ $h = [1, 0.5, 0.2]$ $h=[1,0.5,0.2]$. If the input SNR is 20 dB, calculate the expected SNR improvement assuming ideal equalization.	2	K2	CO3
7.	Analyze the purpose of the Paging Channel (PCH) and Traffic Channel (TCH) in IS-95.	2	K2	CO4
8.	Illustrate how does soft handoff reduce call drop probability in mobile networks.	2	K1	CO4
9.	Asses the effectiveness of multiple access technique used in UMTS over GSM.	2	K2	CO5
10.	Interpret how VoLTE differs from traditional voice services in LATE.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Illustrate the role of base stations and mobile switching centers in cellular networks when a mobile call is connected from one cell to another.	13	K1	CO1
	(OR)			
b)	Explain the concept of handoff in cellular networks with its types of handoff (hard, soft, horizontal, vertical) and criteria for initiating handoff.	13	K1	CO1
12. a)	Demonstrate the parameters delay spread, Doppler shift, coherence time, and coherence bandwidth of mobile multipath channels with their significance in detail.	13	K2	CO2
	(OR)			
b)	Discuss Rayleigh and Rician fading models with the mathematical representation.	13	K1	CO2
13. a)	Explain how adaptive equalization algorithms such as LMS and RLS are used in communication receivers for channel estimation and compensation.	13	K2	CO3
	(OR)			
b)	Outline the working of the Alamouti scheme for a 2×1 and 2×2 MIMO configuration and explain its decoding process at the receiver.	13	K2	CO3
14. a)	Illustrate the architecture of the IS-95 CDMA system with its all major components such as MSC, BSC, BTS, and MS along with its function.	13	K2	CO4
	(OR)			
b)	Interpret how GPRS architecture support packet-switched data over GSM networks and outline it's the role in SGSN and GGSN.	13	K1	CO4
15. a)	Illustrate the LTE system architecture and discuss the role of eNodeB, EPC and interfaces involved in LTE communication.	13	K2	CO5
	(OR)			
b)	Clarify the 5G network architecture, including NG-RAN, 5GC, and how it supports heterogeneous services and ultra-reliable low-latency communication (URLLC).	13	K1	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	Case: A mobile operator plans to deploy a cellular network in a metropolitan city. Each cell is hexagonal, and the operator wants to provide service to 100,000 users with minimum interference.	7+8	K3	CO5

Questions: Design a cellular layout showing frequency reuse. Calculate the minimum cluster size required if the co-channel interference ratio must be at least 18 dB. Propose a channel assignment strategy for high-traffic areas. Justify your choice of fixed, dynamic, or hybrid channel allocation.

(OR)

b)	Case: A telecom operator is designing a wireless broadband system for a high-speed train environment where users experience Rayleigh fading due to high mobility. The system uses 16-QAM modulation, 2×2 MIMO antennas, and incorporates adaptive equalization and interleaving to improve reliability. The operator plans to use Alamouti STBC for transmit diversity and is considering using spatial multiplexing for higher throughput.	8+7	K3	CO3
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Questions: Explain the difference between linear modulation (e.g., 16-QAM) and constant envelope modulation (e.g., MSK) in terms of power efficiency and spectral efficiency. Discuss the impact of Rayleigh fading on the error performance of 16-QAM. How does fading affect BER compared to an AWGN channel?