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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

Department of Electronics and Communication Engineering
VII Semester
EC5008 Wireless Communication Networks
(Regulation2019)

Time:3hrs   Max.Marks: 100

CO1	Ability to comprehend the 4G technology and appreciate the significance of 5G technology and its architecture
CO2	The student would be capable of characterizing the different 5G potential Candidate Waveforms.
CO3	The student would be capable of understanding the different 5G multiple access Schemes.
CO4	The student would be able to identify suitable signaling and power allocation and optimization techniques for the wireless systems
CO5	The student would be capable of exploiting multiple antenna techniques for capacity/ performance gains and explore other research areas in 5G.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	List the features 5G.	2	CO1	L1
2	What is the need of CP in OFDM?	2	CO1	L2
3	Compare single carrier and multicarrier systems.	2	CO2	L2
4	List the Shortcomings of UFMC.	2	CO2	L1
5	What is SCMA?	2	CO3	L1
6	What do you understand by Beamforming?	2	CO3	L2
7	Differentiate between local and global optima.	2	CO4	L2
8	Identify the objective function, decision variables and constraints for a real world problem.	2	CO4	L3
9	What do you mean by Machine type Communication?	2	CO5	L1
10	Mention the different techniques that can be pursed to tackle inter cell interference.	2	CO5	L1

PART- B (5x 13=65Marks)

Q.No.	Questions	Marks	CO	BL
11 (a)	Draw the radio access network architecture and explain the components in details. What are the different types of RAN architectures?	13	CO1	L1
	OR			
11 (b)	What is UDN? Explain the challenges in utilizing existing cellular networks for UDN?	13	CO1	L1

Q.No.	Questions	Marks	CO	BL
12 (a)	How FBMC is different from CP OFDM / OFDM? Explain FBMC with suitable illustration	13	CO2	L2
OR				
12 (b)	What is the principle behind Universal Filtered Multi Carrier system. Explain its transceiver with suitable diagrams.	13	CO2	L2
13 (a)	With example and power equations explain how superposition coding and successive interference cancellation is done in power domain NOMA. Explain with equations how the power allocation coefficients are calculated and how the rate of NOMA is superior.	13	CO3	L4
OR				
13 (b)	Describe the necessity and types of cooperative relaying in 5G with suitable diagrams.	13	CO3	L4
14 (a)	Differentiate multi objective and multidimensional power optimization. Explain the key concepts and techniques used for multi objective optimization.	13	CO4	L3
OR				
14 (b)	Represent the key components of ant colony optimization and how they work together to find optimal solutions.	13	CO4	L3
15 (a)	Discuss in detail, the basic forms of massive MIMO hardware implementation providing tradeoff between gain and cost.	13	CO5	L3
OR				
15 (b)	Brief about the radio resource management techniques for mobile broadband D2D and describe the design challenges and solutions that make D2D an efficient technology in 5G.	13	CO5	L3

PART- C(1x 15=15Marks)
(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Suppose a genetic algorithm uses chromosomes of the form x = a b c d e f g h with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: $f(x) = (a + b) - (c + d) + (e + f) - (g + h)$ and let the initial population consist of four individuals with the following chromosomes: x1 = 6 5 4 1 3 5 3 2 x2 = 8 7 1 2 6 6 0 1 x3 = 2 3 9 2 1 2 8 5 x4 = 4 1 8 5 2 0 9 4 (i) Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last. (ii) Cross the fittest two individuals using one–point crossover at the middle point. (iii) Cross the second and third fittest individuals using a two–point crossover (point's b and f). (iv) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover. (v) Suppose the new population consists of the six offspring individuals received by the crossover operations in the above question. Evaluate the fitness of the new population, showing all your workings. Has the overall fitness improved?	5*3	CO4	L5