SRM Institute of Science and Technology
College of Engineering and Technology

DEPARTMENT OF ECE

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Academic Year: 2024-25 (ODD)

Test: CLAT–II
Course Code & Title: 18ECC301T Wireless Communications
Year & Sem: IV / VII

Date: 26/06/2024
Duration: 9:40 AM to 11.30 AM
Max. Marks: 50

Course Articulation Matrix:

	18ECC301T - Wireless Communication	Program Outcomes (POs)														
		Graduate Attributes												PSO		
COs	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	Interpret the concepts of Wireless communication and basic cellular networks	3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
CO-2	Analyze different Radio wave propagation models for cellular communication	-	3	-	3	-	-	-	-	-	-	-	-	-	-	3
CO-3	Apply different multipath propagation channel models in wireless systems	-	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO-4	Illustrate the Link performance improvement techniques	-	3	-	-	-	-	2	-	-	-	-	-	-	-	3
CO-5	Summarize different wireless communication standards and systems	-	-	2	-	-	2	-	-	-	-	-	-	2	-	-

Part – A (10 × 1 = 10 Marks)[Instructions: Answer ALL Questions]

Q. No.	Question	Marks	BL	CO	PO
1	Find the far – field distance (in metres) for an antenna with maximum dimension of 1 m and operating frequency of 3000 MHz (a) 20 (b) 40 (c) 60 (d) 80	1	2	2	4
2	_____ occurs when a propagating electromagnetic wave impinges upon a rain drop (a) Refraction (b) Diffraction (c) Reflection (d) Scattering	1	1	2	2
3	If a transmitter produces 100 W of power, express the transmit power in units of dBm and dBw. (a) 17 and 47 (b) 19 and 49 (c) 50 and 20 (d) 47 and 17	1	1	2	4
4	A mobile is located 10 km away from a base station and uses a vertical λ/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, calculate the length (in metres) of the receiving antenna. (a) 0.093 (b) 1.083 (c) 0.077 (d) 0.083	1	2	2	4
5	_____ Model uses diffraction to predict average signal strength at street level. (a) Okumara (b) Walfish and Bertoni (c) Hata (d) Durkins	1	1	2	2
6	_____ small scale multipath measurement uses a wideband pulsed bistatic radar that transmits a repetitive pulse width. (a) Spread spectrum (b) Indirect RF pulse (c) Direct RF pulse (d) Envelope detector	1	1	3	2
7	In slow fading channels, Doppler spread of the channel is much less than the _____of baseband signal (a) Bandwidth (b) Time (c) Phase (d) Symbol period	1	1	3	2
8	If coherence bandwidth is smaller than the bandwidth of the signal, _____ fading occurs. (a)Flat (b) Frequency selective (c) Fast fading (d) Time selective	1	1	3	3

9	The distribution present in envelope of sum of two quadrature gaussian noise is _____. (a) Rayleigh (b) Ricean (c) Gaussian (d) Normal	1	1	3	2
10	The maximum excess delay of the channel is given by (a)$N\Delta\tau$ (b) $\Delta\tau/N$ (c) $2N\Delta\tau$ (d) $(N-1)\Delta\tau$	1	1	3	3
	Part – B1 (2 × 4 = 8 Marks) [Instructions: Answer any TWO Questions]				
11	Calculate the ratio of the Brewster angle with respect to two dielectrics with dielectric constants of 5 and 6.	4	2	2	2
12	For a wireless system, using Friis transmission formula and free space path loss model, deduce the path loss for the receiver to be placed at a distance 'd'.	4	3	2	2
13	Elaborate on how an amoeba cell is evolved.	4	2	2	4
	Part – B2 (2 × 4 = 8 Marks) [Instructions: Answer any TWO Questions]				
14	List the factors influencing the small scale fading.	4	1	3	2
15	Draw the block diagram of Frequency domain channel sounding system and brief about its significance in small scale fading measurements.	4	2	3	2
16	Brief about the significance of Ricean fading and when will it degenerate back to Rayleigh mode?	4	2	3	3
	Part – C (2 × 12 = 24 Marks)				
17	(a) Using necessary equations, derive the path loss for a wireless system using two ray model. **(OR)** (b) Elaborate on Okumara model and calculate the mean path loss using the aforementioned model for the distance d = 50 km, height of the transmitter and receiver to be 50m and 5m respectively in a suburban environment. If the base station transmitter radiates an EIRP of 1KW at a carrier frequency of 900 MHz, Find the EIRP (dBm) and the power received at the receiver where gain at the receiving antenna is 20 dB. Assume the following data for computations (from the Okumura curves A_{mu} (f, d) = 43 dB and G_{Area} = 9 dB).	12 6+6	3 3	2 2	2 4
18	(a) For the scenario of small scale fading, derive the baseband impulse response model with relevant expressions. **(OR)** (b) Consider an aircraft is moving at a constant velocity 'v', along a path segment having length 'd' between the points X and Y, while it receives signals from a remote source 'P'. Derive the path length, phase change in the received signal and the apparent change in the doppler frequency. With the aid of the aforementioned derivation, assuming the speed of an aircraft (which is moving towards the airport control tower with an elevation angle of 25 deg) to be 1000 km/hr. What is the expected doppler shift of the received signal if the communication between the aircraft and control tower operations are at 200 MHz?	12 8+4	3 3	3 3	2 3

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions