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Code No. : 16448 (B) N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
 Accredited by NAAC with A++ Grade

B.E. (E.C.E.) VI-Semester Main Examinations, May/June-2023

Mobile Cellular Communication (PE-I)

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	A spectrum of 33MHz channel is allocated to a wireless FDD cellular system which uses two 25 KHz simplex channels to provide full duplex voice and control channels, Determine the number of channels available per cell if a system uses 7-cell reuse.	2	2	1	1 PSO2
2.	Distinguish different types of channel assignment strategies of a cellular system	2	2	1	1 PSO2
3.	With a neat schematic describe the three basic propagation mechanisms of a mobile radio wave propagation	2	1	2	1,2 PSO2
4.	What is the impulse response of a wireless channel? Also give the expression for impulse response.	2	1	2	1 PSO2
5.	Illustrate why CDMA is also called as spread spectrum technique.	2	1	3	1 PSO2
6.	What is the near-far problem in CDMA system and how to overcome this problem?	2	1	3	1 PSO2
7.	Find the SNR (dB) required to achieve a probability of bit error, (i.e., BER) of 10^{-6} over a Rayleigh fading channel.	2	2	4	2 PSO2
8.	What is the significance of diversity in wireless communication system? Also characterize the diversity order of a system.	2	1	4	1,2 PSO2
9.	Describe the concept of multicarrier modulation scheme (MCM) with a diagram?	2	1	5	1 PSO2
10.	Compute the noise covariance matrix for a MIMO system with receiving antennas 4 and the noise variance is -3 dB.	2	2	5	1,2 PSO2
Part-B (5×8 = 40 Marks)					
11. a)	Define handoff? With a neat schematic explain the procedure of handoff.	4	1	1	1 PSO2
b)	Determine the S/I ratio for the worst case scenario with and without sectoring (60°) by considering a cluster size of 7. Does sectoring improves the capacity of a cellular system? Justify your answer.	4	4	1	1,12 PSO2
12. a)	What is meant by small scale fading model? Also, explain the different types of a small scale fading.	4	2	2	2,12 PSO2

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b)	If the transmit power is 5W and carrier frequency is 2.1 GHz and the receiver is at a distance 3 miles from the transmitter. Assume that the transmitter and receiver gains are 1.6. Determine (i) the received power (dBm) in the free space (ii) the path loss in dB.	4	3	2	2	PSO2
13. a)	With relevant expressions explain the advantages of a CDMA system. Is the effect of interference due to the new user in the CDMA system less than the GSM system? Justify your answer.	5	4	3	1	PSO2
b)	Illustrate the concept of multiple access technique? Also, distinguish the FDMA and TDMA schemes.	3	2	3	1	PSO2
14. a)	Derive the expression of BER for the SISO wireless Rayleigh fading system. Examine whether the Rayleigh fading channel requires high SNR for the BER of 10^{-6} when compared to the AWGN channel?	4	4	4	2,4	PSO2
b)	Consider an $L = 2$ receive antenna wireless channel with complex fading channel coefficients $h_1 = 1/\sqrt{2} + j1/\sqrt{2}$, $h_2 = 1/\sqrt{2} - j1/\sqrt{2}$. Analyze the system model for the multi-antenna channel and derive the SNR with MRC. Also comment on the result.	4	4	4	4	PSO2
15. a)	With a neat sketch explain each block of the OFDM system in detail. Also give the advantages of OFDM over FDM system.	4	2	5	1,4	PSO2
b)	Determine the transmitted symbols of a MIMO system for the given matrix using zero-forcing detection technique at the receiver.	4	3	5	1,4	
$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 1 & 3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$						
16. a)	What is the significance of frequency reuse in the context of a cellular system? With an example explain the concept of frequency reuse in detail.	4	2	1	1	PSO2
b)	Analyze the free space propagation model and give its significance in context of wireless communication.	4	3	2	1,4	PSO2
17.	Answer any <i>two</i> of the following:					
a)	What is the purpose of PN-sequence in CDMA systems? With an example analyze the properties of a PN- sequence.	4	3	3	1	PSO2
b)	Derive the expression of BER for CDMA system.	4	2	4	1,2	PSO2
c)	With relevant expressions explain the MMSE receiver of MIMO system.	4	2	5	1,4	PSO2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	39%
iii)	Blooms Taxonomy Level - 3 & 4	41%
