VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reg. Number:	21BEC1851

Continuous Assessment Test (CAT) – I - FEB 2024

Programme	:	B.Tech. (ECE)	Semester	:	Winter Sem 2023-24
Course Code & Course Title	:	BECE307L Wireless and Mobile Communications	Class Number	:	CH2023240500936 CH2023240500948 CH2023240500956 CH2023240500926 CH2023240500942
Faculty	:	Dr. Hemanth C Dr. Priyanka Das Prof. Ralph S Thangaraj Dr. D. Thiripurasundari Dr. S. Usha Rani	Slot	:	A1
Duration	:	90 Minutes	Max. Mark	:	50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1.		In a cellular system with 168 voice channels, the coverage area is 2500 sq. km with each cell having a radius of 5 km and transmitted power per cell is 0.6W. The system follows a 7-cell reuse pattern. The path loss exponent is 4. Calculate the following: (i) If the cells are split into smaller cells such that the area of each cell is reduced by 4 times, compare the system capacity with and without splitting. **[4]** (ii) Find the transmitted power of the split cell with a new cell radius of R/2, if identical power is received at the boundaries of the original cell and the new split cell. **[2]** (iii) Determine the assignment of voice channels per sector if 120-degree directional antennas are used at the cell site. Compare the signal to interference ratio for the cell having omnidirectional antenna and sectored antennas. **[4]**	**[10]**
2.	a.	What is Handoff in Cellular systems? What algorithms are used to determine when a handoff should occur in Cellular systems?	**[5]**
	b.	Enumerate the primary causes of co-channel Interference in wireless communications. Briefly describe any two techniques used to mitigate the same.	**[5]**
3.		A certain city has an area of 1,300 sq. km and is covered by a cellular system using a 7-cell reuse pattern. Each cell has a radius of 4 km. The average calls per hour in one cell ($U\lambda$) is 3000 and an average call holding time (H) is 1.76 minutes. If the blocking probability is 2%, compute (i) The number of cells in the service area	**[10]**

		(ii) The offered traffic load per cell (iii) The number of channels per cell (iv) The total bandwidth required if each channel uses 40 kHz (v) The maximum traffic carried in the system. Refer Table 1.	
4.		A mobile wireless communication system operating at 2 GHz utilizes two antennas (transmit antenna circularly polarized and receive antenna linearly polarized) separated by 16 km. The maximum gain of the transmitting antenna is 20 dB while the gain of the receiving antennas is unknown. The input power to the transmitting antenna is 100 watts and the power received at the receiver is 5 nW. Assuming that the two antennas are aligned so that the maximum of one is directed toward the maximum of the other and also assuming no reflection/mismatch losses at the transmitter or the receiver, determine: (i) the maximum gain of the receiving antenna (dimensions and in dB). [4] (ii) Free space path loss in dBm. [3] (iii) Calculate the rms voltage induced across these terminals by the transmitted signal if the transmitting antenna terminals are matched to a 50 ohm impedance. [3]	**[10]**
5.		(i) Illustrate the architecture of the second-generation pan-European digital mobile cellular communication standard that uses two 25-MHz frequency bands. [6] (ii) Explain the Network and Switching Subsystem (NSS) of the same. [4]	**[10]**

Table 1

Erlang B Traffic Table

Maximum Offered Load Versus GoS and C

GoS is in %

C ↓	0.01	0.05	0.1	0.5	1.0	2	5	10	15	20	30	40
96	65.92	69.79	71.73	77.24	80.31	84.10	91.15	99.72	107.6	115.7	134.0	157.6
97	66.75	70.65	72.61	78.16	81.25	85.07	92.17	100.8	108.8	116.9	135.5	159.3
98	67.59	71.52	73.48	79.07	82.18	86.04	93.19	101.9	109.9	118.2	136.9	160.9
99	68.43	72.38	74.36	79.99	83.12	87.00	94.22	103.0	111.1	119.4	138.3	162.6
100	69.27	7~.25	75.24	80.91	84.06	87.97	95.24	104.1	112.3	120.6	139.7	164.3

**********All the best **********