VIT

Vellore Institute of Technology

School of Electronics Engineering
Fall 2024-25
CAT I
Programme Name & Branch: B.Tech - ECE

Wireless and Mobile Communications (BECE307L)

Slot: A1 **Exam Duration: 90 mins** **Maximum Marks: 50**

Instructions:

- Answer all the questions
- Erlang B, Erlang C, Q Tables, and Okumura charts are permitted.
- Assume suitable values for any missing variables.

Q1.	a) Describe the concept of frequency reuse and provide an example to illustrate it. **(5)** b) With a neat schematic, explain the procedure of how a call is maintained without dropping during a handover between cell sites. **(5)**
Q2.	a) Consider a communication system where the transmitter emits a power P_t of 10 mW at a frequency of 5 GHz. The gains of the transmitting and receiving antennas are 5 dB and 10 dB, respectively. The system operates over a distance of 5 km in free space. Using the Friis free space propagation model, calculate the received power P_r in dBm. **(5)** b) A mobile is located 5 km away from a base station and uses a vertical $\frac{\lambda}{4}$ 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 $10^{-3}\frac{V}{m}$. The carrier frequency used for this system is 900 MHz. i. Find the length and the effective aperture of the receiving antenna. **(2)** ii. Find the received power at the mobile using the two-ray ground reflection model assuming the height of transmitting antenna is 50 m and the receiving antenna is 1.5 m above ground. **(3)**
Q3.	A 7 cell cluster (with N = 7) has 30 MHz allocated to it for forward channels and each channel is 200 kHz. Assume blocked-calls-delayed system with a probability of delay of 1%, and each user makes one 10 minute call for every 3 hours. i. What is the number of users that can be supported? **(3)** ii. What is $P\,[delay > 10sec]$? **(3)** iii. What is the number of users that can be supported, if it is a blocked-calls-cleared system with GOS of 1%? **(4)**