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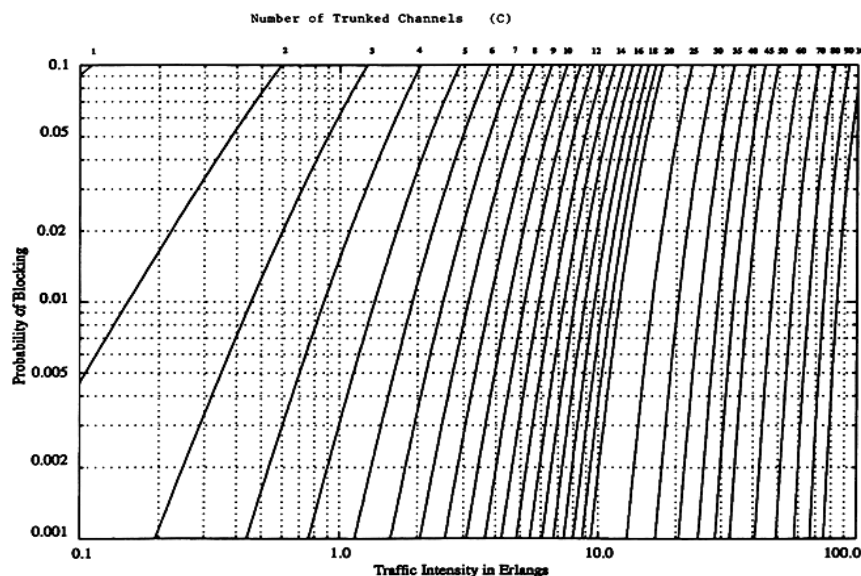
Dept. of ECE

18ECC301T – Wireless Communication

ASSIGNMENT-1 (50 Marks)

Submission Deadline: 7.8.2023

1. If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a) $n = 4$, (b) $n = 3$? Assume that there are 6 co-channels cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. (5)
2. An urban area has a population of 2 million residents. Three competing trunked mobile networks (systems A, B, and C) provide cellular service in this area. System A has 394 cells with 19 channels each, system B has 98 cells with 57 channels each, and system C has 49 cells, each with 100 channels. Find the number of users that can be supported at 2% blocking if each user averages 2 calls per hour at an average call duration of 3 minutes. Assuming that all three trunked systems are operated at maximum capacity, compute the percentage market penetration of each cellular provider. (The graph below can be used) (5)



3. A certain city has an area of 1,300 square miles and is covered by a cellular system using a 7-cell reuse pattern. Each cell has a radius of 4 miles and the city is allocated 40 MHz of spectrum with a full duplex channel bandwidth of 60 kHz. Assume a GOS of 2% for an Erlang B system is specified. If the offered traffic per user is 0.03 Erlangs, compute (a) the number of cells in the service area, (b) the number of channels per cell, (c) traffic intensity of each cell, (d) the maximum carried traffic; (e) the total number of users that can be served for 2% GOS, (f) the number of mobiles per channel, and (g) the theoretical maximum number of users that could be served at one time by the system. (The graph ABOVE can be used) (5)
4. a. "As New Cell Area is 1/4 of the older area (now one bigger cell include approximately 4 smaller cells), therefore the capacity of system is increased by 4

times". Justify the aforementioned statement if the Total BW available is 25MHz and each user requires 25 kHz with cell splitting technique. (5)

b. For the path loss exponent of 4 and cell splitting cell radius of $R/2$, Calculate the ratio of P_{t1} (Transmit Power at old cell) to P_{t2} (Transmit Power at new cell). (5)

5. Derive closed form formula for S/I in cellular system with reference to co-channel interference. (5)

6. Describe briefly with neat diagrams Sectoring and Micro cell zone concepts. (10)

7. Explain the working of Paging and Cordless Telephone with block diagrams. (10)
