Mr. Mumish Sood.

COURSE CODE: 10B1WEC731　　　　　　　　　　　　　　　　MAX. MARKS: 35
COURSE NAME: Mobile Communication
COURSE CREDITS: 3　　　　　　　　　　　　　　　　　　　MAX. TIME: 2 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1) Determine the received signal power by a mobile at a distance of 10 km from a 50 watt cell site transmitter operating at a carrier frequency of 1900 MHz. The Transmitter antenna gain is 10 dBi and receiver antenna gain is 15 dBi. Assume free space propagation condition.
(5)

Q2) Use the Hata propagation model to determine the maximum radii of cells at 900 MHz and 1900 MHz respectively, having a maximum acceptable path loss of 130 dB. Assume a cell site antenna height of 50 m and a mobile antenna height of 2 m. **(5)**

Q3) Determine the radio coverage range of a base station that transmits a RF signal at 100 W, given that the receiver threshold level is -100dBm. Assume that the path loss at the first meter is 30 dB in a mobile radio propagation condition($\gamma = 4$). **(5)**

Q4) Consider a transmitter which radiates a sinusoidal carrier frequency of 1800 MHz. For a vehicle moving 100 km/h, compute the received carrier frequency if the mobile is moving **(5)**

(a) Directly towards transmitter.
(b) Directly away from the transmitter.
(c) In a direction perpendicular to the direction of arrival of the transmitted signal.

Q5) A TDMA digital cellular system is designed to accept a C/I value of 15 dB. Find the optimum value of K for **(5)**
　　a) Omni-directional antenna design
　　b) Six sector 60^0 directional antenna design

Q6) Illustrate and prove that for a regular hexagonal geometry, the frequency reuse ratio is given by the relationship $q = \sqrt{3K}$ where $k = i^2 + j^2 + i \times j$; I and j being the shift parameters. **(5)**

Q7) An urban area has a population of 15 lakh residents. Three competing trunked mobile Networks (system 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 with 100 channels each. 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 three minutes. Assuming that all three trunked systems are operated at maximum capacity, compute the percentage market penetration of each cellular provider. **(5)**