Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SIXTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - APRIL / MAY 2017
SUBJECT: MOBILE COMMUNICATION (ECE - 4010)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Explain the various techniques to improve the coverage and capacity in cellular systems.

1B. A cellular system with 12.5 MHz is to be operated in a city of 100 km^2 with an allowed S/I of 12 dB. A MS moving with a maximum speed of 72 kmph is forced for handoff after 4 min when it crosses the cell for maximum distance. Estimate co-channel antenna spacing, P_{th} (threshold power), if the handoff processing time is 4sec. Let, P_0 = 3 dBW at 1m, n = 3. (Assume path loss, $P(r) = P_0 - 10n \log(d_i/d_0)$.

1C. Explain the practical handoff considerations in cell design.

(5+3+2)

2A. Derive an expression for E-field at a distance 'd' using Ground Reflection (2-ray) Model.

2B. Explain the following with suitable examples and mention the ways to resolve these problems.

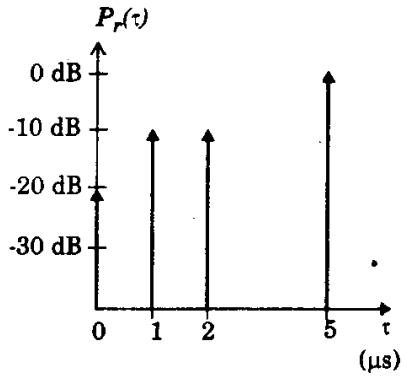
i) Hidden and Exposed terminal problems ii) Near and Far terminal problems.

2C. A mobile is located 5 km away from a BS and uses a vertical λ/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} V/m. The carrier frequency used for this system is 900 MHz. a) Find the length and the aperture area of receiving antenna. b) Find the received power at the mobile using the 2-ray ground reflection model assuming that the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above the ground.

(5+3+2)

3A. Derive the relationship between bandwidth and power received from multipath channel using channel sounding techniques.

3B. The Power Delay Profile of a fading channel is given as



Find when flat and Frequency selective fading occur?

3C. Discuss the use of Rayleigh and Ricean distributions for a fading channel.

(5+3+2)

4A. Classify the GSM channels and explain each classification in detail.

4B. A discrete channel impulse response is used to model urban RF radio channels with excess delays as large as 100 μs and microcellular channels with maximum excess delay as 4 μs. If the number of multipath bins is fixed at 64, find (a) $\Delta\tau$ (b) the maximum RF BW which the SMRCIM models can accurately represent. Repeat the problem for an indoor channel model with excess delays as large as 500 ns.

NOTE: The channel model used to analyze Transmitter RF signals having BWs < $2/\Delta\tau$

4C. Find the 3dB bandwidth for a Gaussian LPF used to produce 0.25 GMSK with a channel data rate of R_b = 270 kbps. What is the RF channel bandwidth for GMSK as $0.57R_b$ containing a 90% of power? Specify the value of Gaussian filter parameter α for both the cases.

(5+3+2)

5A. Explain the architecture of GPRS with neat diagrams.

5B. Discuss the various techniques to modify TCP for supporting mobile environments.

5C. Draw the WAP stack and mention the functions of each layer.

(5+3+2)