MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2019 SUBJECT: MOBILE COMMUNICATIONS (ECE - 4010)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Mention the timing diagram that represents a call establishment to a GSM Mobile user initiated by a landline subscriber.
- 1B. Assuming that 6 cells are close enough to create significant interference and they are approximately equidistant from the desired BS. For the US AMPS system that uses FM and 30 kHz channels, it indicates that sufficient voice quality is provided when S/I is greater than or equal to 18 dB. i) What would be the cluster size? (n=4) ii) What is the worst case S/I.
- 1C. Mangalore has an area of 2000 sq km and is covered by a GSM cellular system having allowed C/I as 15 dB with n=3. Each cell has a radius of 4km and using total bandwidth of 40MHz. Find the number of channels per cell.

(4+3+3)

- 2A. Explain any FOUR practical Handoff considerations.
- 2B. The average mobile user has 500 minutes of use per month; 90% of traffic occurs during working days. There are 20 week days per month. Assuming that in a given day, 10% of traffic occurs during the busy hour (BH), determine the traffic per subscriber per BH.
- 2C. Given that the MS is located at the cell boundary which is R km from the BS and BS transmits at the carrier frequency of 2000MHz with 1W power. Transmitting antenna gain $G_t = 1.64$ and receiving antenna gain $G_r = 1$. Assume the speed of propagation for electromagnetic waves = 3×10^8 m/s and minimum power required by the MS to operate is -90dBm. If the heights of the transmitting and receiving antennas are 50m and 1.5m, respectively, please find the cell radius R km, when the path loss obeys 2-ray model.

(4+3+3)

- 3A. Derive the baseband impulse response of a multipath wireless channel.
- 3B. Calculate the mean excess delay, rms delay spread, and the maximum excess delay (10 dB) for the multipath profile given in the **Figure 3B**. Also estimate the 50% coherence bandwidth of the channel. Determine if a GSM signal under those systems will experience frequency selective or flat fading.
- 3C. Classify the Small-Scale fading channels. Mention the characteristics of each class.

(4+3+3)

4A. Mention the classification of GSM Channels. Write the details of each classification.

- 4B. Draw the LTE Protocol architecture. Mention the functions of each layer.
- 4C. Draw the architecture of GPRS network architecture. Mention the functions of the major elements in GPRS other than GSM elements.

(4+3+3)

- 5A. Propose any FOUR techniques to modify the TCP to support mobile networks. Also mention advantages and disadvantages.
- 5B. Explain the functioning of IP Protocol that supports Mobility and also mention the steps of communicating with a remote host with help of neat diagrams.
- 5C. Draw the architecture of WAP and its protocol stack. Also mention the functions of each layer.

(4+3+3)



Figure 3B