B.Sc. Engg. / HD CSE 5th Semester (58)   24 April 2012 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION   WINTER SEMESTER, 2011-2012
DURATION: 3 Hours   FULL MARKS: 150

CSE 4505: Communication Engineering

Programmable calculators are not allowed. Do not write anything on the question paper.
There are **8 (eight)** questions. Answer any **6 (six)** of them.
Figures in the right margin indicate marks.

---

1. a) Give the taxonomy of multiple access protocols.   5
   b) Briefly explain the causes of Transmission impairments.   8
   c) What is CDMA? With an example, show how data can be encoded and decoded   12
      between a sender and receiver in a three station environment. You have to generate the
      Chip code by using Walsh table.

2. a) Mention some of the salient features of 3rd generation mobile telecommunications (3G).   5
   b) With the aid of a Timing diagram illustrate how a call to a mobile user initiated by a   10
      PSTN subscriber is established.
   c) Show the process of constructing a GSM frame of 156.25 bits by using channel coding   10
      and interleaving.

3. a) Draw the GSM system architecture and explain concisely.   10
   b) Give the names of all logical channels available in GSM. Present the tasks of each   10
      common control channel (CCCH).
   c) Name some of the radio system design issues?   5

4. a) Mention the operational frequency bands of satellite communication.   5
   b) Write short notes on any two of the followings: 10

      i. Traffic Intensity   ii. Cell Splitting   iii. Trunking

   c) A system has 1000 cells with 25 traffic channels available where a minimum SIR of
      15dB must be maintained. Consider that there are 6 channels in the first tier. Find the   10
      minimum cluster size with path loss exponent n is 3. What will happen if path loss
      exponent n becomes 4? Will the cluster size increase or decrease?

5. a) Briefly discuss the architecture of a satellite communication system.   10

   b) Using CRC error detection scheme perform the following: (Use 1011 and 0000 as the   10
      divisors)

      i. Generate the codeword of 1001 using CRC encoder.

      ii. A codeword 1000110 has been received. Determine whether the dataword
          should be accepted or rejected using CRC decoder.

   c) Mention the limitations of simple parity check codes.   5

6. a) Explain the frequency reuse concept in cellular communication with appropriate figure and equation. **12**

b) Write short notes on any one of the followings: **5**

      i) MAHO   ii) Umbrella Cell Concept

c) A 30 MHz spectrum is allocated to a wireless system which uses two 25 KHz simplex channels to provide full duplex voice and control channels. Compute the number of channels available per cell if that system uses i. 7-cell reuse and ii. 4-cell reuse. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell of that system. **8**

7. a) Briefly explain the types of interference that can occur in a cellular system. **7**

b) How does "Plane Earth" propagation loss model differ from the free-space loss model? **6**

c) Calculate CNR at the receiver when the transmitter output power P_T is 750 mW, the transmission line (feeder) losses at each end are 3.4 dB, the distance between the transmitter and receiver site is 25 km, the operating frequency is 7.1 GHz, and the antenna gains are 30.5 dB at each end. Assume a gaseous absorption loss of 0.3 dB, a 12 dB noise figure, 4.2 MHz bandwidth and average room temperature 290 K. **12**

8. a) How does Empirical Path Loss Model differ from Deterministic Path Loss Model? Name one well known path loss model of each category. **7**

b) Write short notes on any two of the followings- **10**

      i. Doppler shift   ii. Coherence Time   iii. Frequency dispersion

c) Consider that a vehicle is moving in 40 m/s where the carrier frequency is 900 MHz and delay spread is 3µs. What will be the maximum Doppler shift? Calculate coherence time and coherence bandwidth. If symbol rate is 15 kbps and system bandwidth is 900 KHz, then find out what kind of fading will be experienced. **8**