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

MID SEMESTER EXAMINATION **WINTER SEMESTER, 2012-2013**

DURATION: 1 Hour 30 Minutes **FULL MARKS: 75**

CSE 4505: Communication Engineering

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) Name the major issues to be considered for designing a radio system. Mention some of the salient features of 3rd generation mobile telecommunications (3G). 8
   b) What is CDMA? With an example, show how data can be encoded and decoded between a sender and a receiver in a three-station environment. Generate the chip codes for 16 stations using Walsh table. 12
   c) Suppose the bandwidth of a communication link is 3.1 kHz and SNR is 30 dB. What will be the maximum capacity of the link according to Shannon's capacity formula? 5

2. a) What is TDMA and FDMA? How can these two be used together? 8
   b) Give the taxonomy of all logical channels available in GSM. 5
   c) Mention different stages of the GSM transmission process in appropriate order. Demonstrate how four GSM bursts (each of 156.25 bits) are constructed from a 20 milliseconds voice signal following the steps of the GSM transmission process. 12

3. a) Neatly sketch the GSM system architecture. Briefly explain the major functionalities of different subsystems of the GSM system model. 12
   b) With the aid of a diagram, show the relationship among different areas in GSM. 5
   c) Briefly explain frequency hopping spread spectrum (FHSS). What is the main motivation of using FHSS that outweighs its bandwidth efficiency? 8

4. a) With the aid of a timing diagram, illustrate how a call initiated by a mobile station is established. Mention the name of different logical channels used in different stages of call establishment. 10
   b) What is the significance of using Training sequence (T), Guard Period (GP) and Stealing bits (SF) in a GSM burst? Mention the duration of a GSM burst and a frame. 7
   c) Suppose a new mobile communication standard is defined as an alternative to the GSM with the following frequency specifications: 8

      Uplink: 1400-1550 MHz
      Downlink: 1600-1750 MHz

      The new standard also specifies that carrier frequencies of two nearby channels are working at 400 kHz apart for better voice quality. As a telecommunication engineer, calculate the following specifications of the new standard.

      i. Wavelength ii. Bandwidth iii. Duplex Distance iv. No of Radio Channels