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

07 November 2017

SEMESTER FINAL EXAMINATION
SUMMER SEMESTER, 2016-2017
DURATION: 3 Hours
FULL MARKS: 200

CSE 4405: Data and Telecommunications

Programmable calculators are not allowed. Do not write anything on the question paper.
There are **8 (eight)** questions. **Question no. 2 is mandatory**. Answer any **5 (five)** from the rest of them.
Figures in the right margin indicate marks.

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1. a) What do you understand by Data Communications? Explain the components of a communication system. 7
   b) Explain the types of data communication based on data flow. 7
   c) What do you understand by network topology? Explain the basic network topologies with their strengths and weaknesses. 14
   d) You have two computers connected by an Ethernet hub at home. Is this is LAN, a MAN or a WAN? Justify your answer with appropriate reason. 5

[Mandatory Question]

2. a) What is OSI model of communication? Write down the names of each of the layers of OSI model and mention functionalities of each of them. 7×3
   b) Explain four types of addressing with appropriate examples. 4×3
   c) How OSI and ISO are related to each other? 2

3. a) Write down the names of protocols working in each layers of TCP/IP protocol suite. 10
   b) What do you understand by Shannon Capacity? Consider you have a channel with bandwidth 1.0 MHz. The SNR for this channel is 63. What are the appropriate bit rate and signal levels. 8
   c) What is latency? What are the components of latency? Explain each of them with appropriate examples. 15

4. a) Explain different types of data transmission mode with appropriate diagrams. 4×3
   b) Encode the bit pattern **1011 0011** into following encoding techniques 10
      i. NRZ-I
      ii. NRZ-L
      iii. Manchester
      iv. Differential Manchester
      v. Multilevel 2B1Q
   c) What are the techniques used for Digital-to-analog conversion? Explain each of them briefly. 11

5. a) What is multiplexing? Explain the Frequency Division Multiplexing (FDM) process with appropriate diagram. 15
   b) What are the strategies used when the input of a multiplexing have different frequencies? Explain each of them with appropriate examples or diagrams (if necessary). 3×3
   c) Compare the delay time in Circuit Switching Networks and Datagram Networks with appropriate diagram. 9

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6. a) Give the taxonomy of switched networks. Explain three phases of a circuit switched network's data transmission.
   b) What do you understand by Cyclic Redundancy Check (CRC)? If both of the devices using CRC technique agrees that the divisor should be **1010.** Generate appropriate codeword for the dataword **1001** for the format *C(7,4)*. Also show how you can check whether the received codewrod has been changed or not.
   c) What is minimum hamming distance? A coding scheme has a Hamming distance $d_{min} = 5$. What is the error detection and correction capability of this scheme?

7. a) Explain the architecture of a Satellite Communication System with appropriate diagram. Why the uplink frequency of Satellite Communication System is greater than the downlink frequency?
   b) What are the different modes of propagation in fiber optic cable? Explain each of them with appropriate diagram.
   c) Explain the mechanisms of antennas used in unicast transmission and reception of radio waves with appropriate diagram.

8. a) What is GSM? With appropriate diagram, show the various components of a GSM network. Briefly mention the functionalities of each of the components.
   b) Explain the problems of satellite communication system with examples.
   c) In Figure 1, if the received signal power at point 4 is 20 mW, then calculate the initial transmission power at point 1.

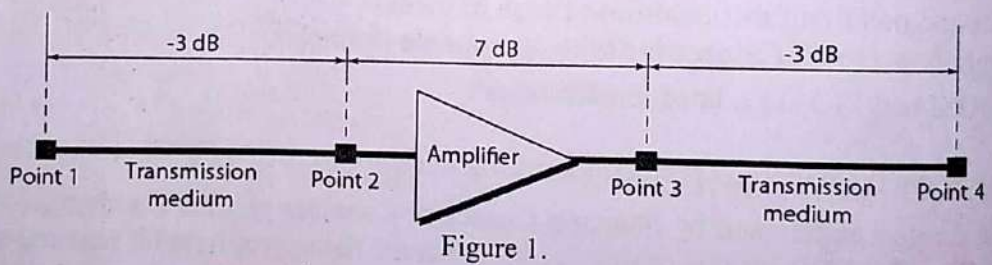

Figure 1.