SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology

First Year, Second Semester Examination – 2017

HNDIT1213 – Data Communications and Networks

Instructions for Candidates:
Answer any five (05) questions only.

No. of questions : **06**
No. of pages : **04**
Time :**03 Hours**

Marking Scheme

Question 1

I. Define data and signal. [04 Marks]

Data

Data usually refers to raw data, or unprocessed data. It is the basic form of data, data that hasn't been analyzed or processed in any manner

Signal

In order for data to be transferred electronically, it must first be converted into electromagnetic signals. The signal can then be used to transfer data from one device to another device. The signal can be either analog or digital in nature.

II. Write three (03) advantages of computer networks? [03 Marks]

- **Accessing, databases and transferring, processing and retrieval of data can be done on-line**
- **Online credit card checking, e-commerce and Electronic Fund Transfer are possible**
- **Easily administered**
- **Provides an efficient means of communication such as e-mail, Voice mail, and Video conferencing**
- **Users can be easily added or removed.**
- **Tasks of distributed nature can be processed by distributed computer systems by exchanging data.**
- **Provides a way to share data, programs, peripherals and information.**
- **Provides data security.**
- **OR any other advantages of computer networks**

III. What are the five (05) conditions to be satisfied to establish a successful communication? [05 Marks]

- **Availability of a sender**
- **Availability of a Receiver**
- **Availability of a transmission medium**
- **Availability of response from the receiver.**
- **Availability of a set of protocols that governs the communication.**

IV. Briefly describe the three (03) characteristics of a sine wave. [06 Marks]

a. **Amplitude (A)**
   - **The maximum value / strength of the signal over time**
   - **It is the value of the signal at different instants of time. It is measured in volts.**

b. **Frequency (F)**
   - **Frequency is the rate at which the signal repeats. Expressed in Hertz (Hz), or cycles per second. .**
   - **It is inverse of the time period, i.e. f = 1/T. The unit of frequency is Hertz (Hz) or cycles per second.**

c. **Period (T)**
   - **The amount of time that a wave takes for one repetition.**

V. What is the relationship between period and frequency? [02 Marks]

- **Frequency is the inverse of the time period, i.e. f = 1/T.**

(Total 20 Marks)

Question 2

I. What do you mean by network topology? [02 Marks]

Network topology is the arrangement of the various elements (links, nodes, etc.) of a communication network

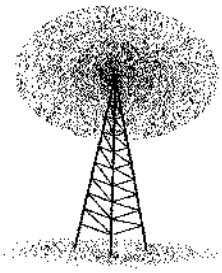
II. Name three (03) network topologies. [03 Marks]

Star, bus, mesh, tree, ring

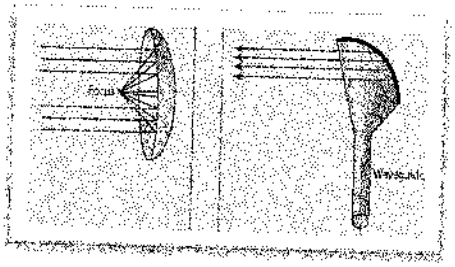
III. Name a network device which can perform both switching and routing? [01 Marks]

L3 switch

IV. Identify the types of antenna given below. Breifly explain them. [04 Marks]



Type 1



Type 2

Type 1: Omni directional Antenna
Radio waves are used for multicast communications, such as radio and television, and paging systems.

Type 2: Unidirectional Antenna
Microwaves are used for unicast communication such as cellular telephones, satellite networks, and wireless LANs

V. What are the two types of cryptographic algorithms? Briefly explain. [04 Marks]

a. **Symmetric key Cryptography**
   - **The same key is used by both parties.**
   - **The sender uses this key and an encryption algorithm to encrypt data**
   - **The receiver uses the same key and the corresponding decryption algorithm to decrypt the data**

b. **Asymmetric key cryptography**
   - **In asymmetric or public-key cryptography, there are two keys: a private key and a public key.**
   - **The private key is kept by the receiver.**
   - **The public key is announced to the public.**
   - **The public key is available to the public**
   - **The private key is available only to an individual.**

VI. A student is communicating with another student when writing an exam with encrypted text using Caesar's cipher (Key 4) . The encrypted message is " **hs rsx ewo qi xli erwaiv**". Find the plain (original) text he sent. [06 Marks]

do not ask me the answer (for 1 word decrypt correctly 1 mark-> 1*6)

(Total 20 Marks)

Question 3

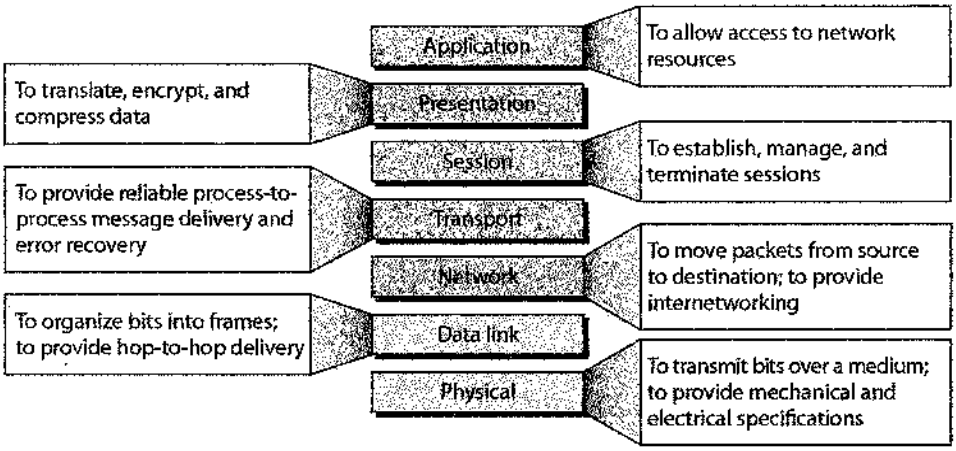
I. Define the term "Data Communication Protocol". Give two (02) examples. [03 Marks]

Data communications protocol is a set of rules or an agreement that determines the format and transmission of data.

II. Name the seven (07) layers of OSI model. [04 Marks]

Layer 7--Application layer.
Layer 6--Presentation layer.
Layer 5--Session layer.
Layer 4--Transport layer.
Layer 3--Network layer.
Layer 2--Data Link layer.
Layer 1--Physical layer.

III. Write the function for each of the above layers. [07 Marks]



IV. The protocol data units (PDUs) in different OSI layers are called in different names. Identify the names of the PDU for each of the layers given below.

a. Layer 2
b. Layer 3
c. Layer 4 [03 Marks]

a. Layer 2 - Frames
b. Layer 3 - Packet
c. Layer 4 - Segments

V. Name one (01) device which operates for each of the following layers. [03 Marks]

a. Layer 1
b. Layer 2
c. Layer 3

a. **Layer 1 - Hubs, Repeaters**
b. Layer 2 - Switches, bridges, NIC's
c. Layer 3 - Routers, layer 3 switches

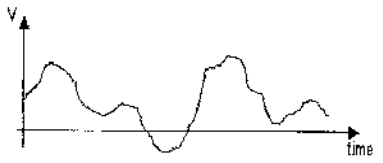
(Total 20 Marks)

Question 4

I. Define analog and digital signal. [04 Marks]

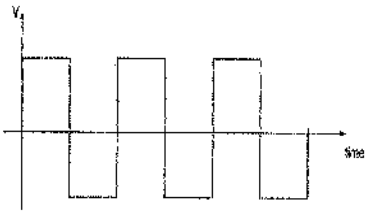
Analog signal

Signal intensity varies continuously over time.



Digital Signal

Signal intensity is constant for some period of time and then changes to another constant value. This transition takes place in a very short time.



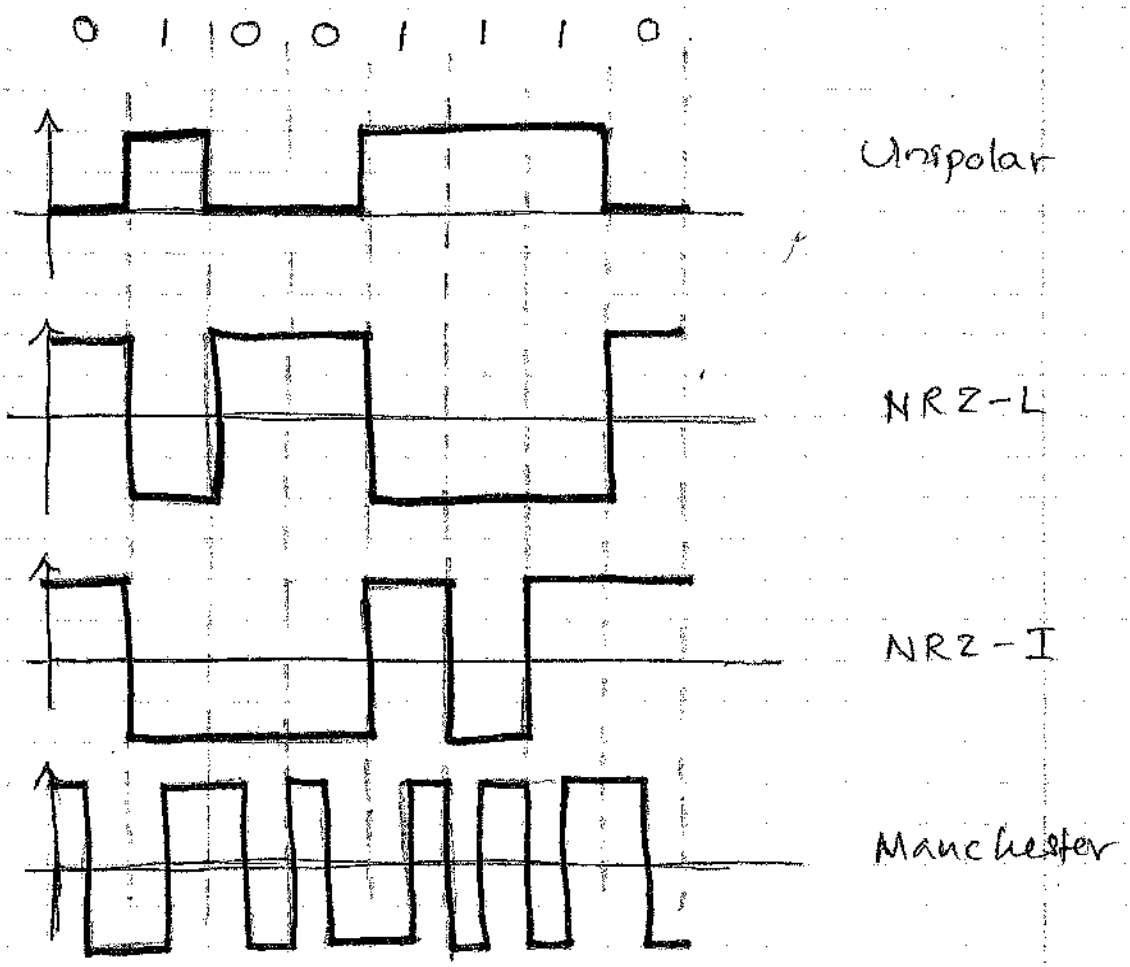
II. What do you mean by "Periodic signal". [02 Marks]

Periodic signal completes pattern within a measurable time frame, called a period

Repeats that pattern over subsequent identical periods

III. Sketch the wave forms for each of the following encoding schemes for the bit stream "**01001110**". [08 Marks]

a. Unipolar
b. NRZ- L
c. NRZ-I
d. Manchester



IV. A student has viewed the MAC address of his PC as 00:05:9A:3C:78:00 . [06 Marks]

a. How does he get the above MAC address of the PC using MS-DOS?
ipconfig /all

b. What is the organizational unique identifier for his MAC Address?
00:05:9A

c. What is the usage of broadcast MAC Address?
It is used by source host to forward a packet to all host on the network.

(Total 20 Marks)

Question 5

I. Write the two (02) types of transmission media. Give two examples for each. [04 Marks]

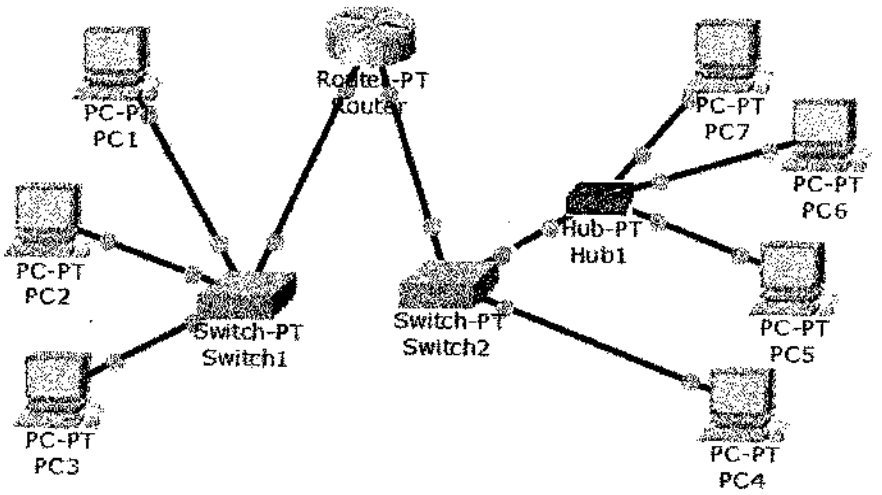
Guided: Twisted Pair, Coaxial cable and Optical Fiber

Unguided: Radio Wave, Microwave and Infrared

II. Write three (03) advantages of fiber cables over the copper cables. [03 Marks]

Speed, less attenation, greater distances

III. A student designed a network diagram using a network simulator as given below. He used a router, a hub, two switches and seven (07) computers for this network.



a. If he wants to connect these two switches together, which type of cable can be used? [02 Marks]

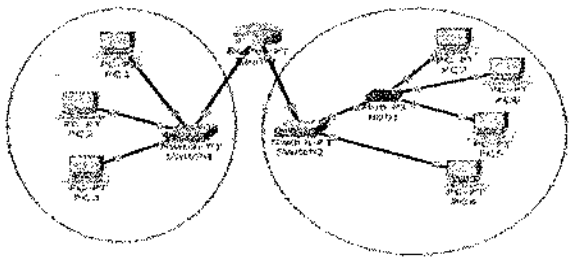
crossover cable

b. PC4 needs to send a message to PC7 only. Is it possible to send a message only for PC7 ? Justify your answer briefly. [03 Marks]

No, Hub is a single collision domain. The messages received to hub will be distributed to all the PCs connected to it. Therefore, PC5, PC6 also can read the messages sent by PC4

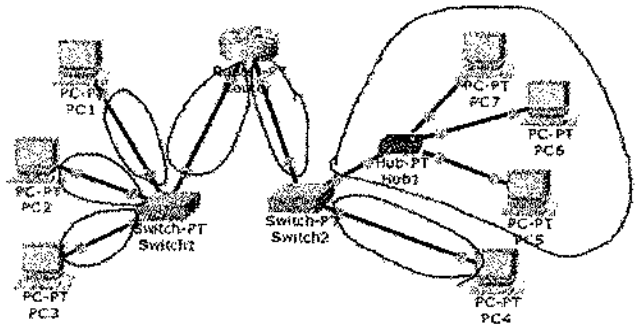
c. How many broadcast domains available in this network diagram? Draft it using skethes. [03 Marks]

2 broadcast domains



d. How many collision domains available in this network diagram? Draft it using skethes. [05 Marks]

7 Collision domains



(Total 20 Marks)

Question 6

I. What is the need of IP address in computer network ? [02 Marks]

For uniquly identify the PCs in the network

II. Write down the followings, according to the given IP address using CIDR notation: 176.228.32.230/25.

a. Default class of the above IP address. [02 Marks]

Class B

b. Network address on this subnet [02 Marks]

176.228. 00100000. 11100110

176.228. 00100000. 11100110

Answer :176.228.32.128

c. Number of hosts on this subnet [02 Marks]

Answer :(2^7)=128

Valid hosts=126 (if student answer with some statement,accept this answer)

d. First host on this subnet [02 Marks]

Answer :176.228.32.129

e. Last host on this subnet [02 Marks]

Answer :176.228.32.254

f. Broadcast address on this subnet [02 Marks]

Answer :176.228.32.255

g. Number of subnetworks [02 Marks]

2^9 (512)

III. Assume you are working as the network administrator in a computer laboratory, a PC assigned an IP address of 192.168.20.101 with network mask 255.255.255.0. The router in your laboratory network have been configured using an external IP address which obtained from Internet Service Provider (ISP) 138.76.29.20

a. What is the process of mapping local IP addresses to single public IP address ? Breifly explain it. [02 Marks]

NAT - Network Address Translation is a way to map an entire network (or networks) to a single IP address. NAT is necessary when the number of IP addresses assigned to you by your Internet Service Provider is less than the total number of computers that you wish to provide Internet access for.

b. When you try to access the facebook.com (69.171.230.68) from your PC, in which IP address that facebook server will identify you? [01 Marks]

138.76.29.20

c. When you send a file to a friend's PC assigned with the IP address of 192.168.20.150, What is the source address of the packet headers regarding the file that you send?

192.168.20.101 [01 Marks]

(Total 20 Marks)