Higher National Diploma in Information Technology
First Year, Second Semester Examination – 2016
HNDIT1213- Data Communications and Networks
IT2004- Introduction to Data Communications & Computer Networks

Instructions for Candidates:
Answer any **Five (05) questions**
All questions carry equal marks

No. of questions : 06

Time : **Three (03) hours**

Marking Scheme

Q1.

i. What is data communication? **(01 mark)**

Communication of binary encoded data from one place to another is known as Data Communication.

ii. In order to establish communication what are the conditions which should be satisfied?

(1 X 5=05 marks)

a. Availability of a sender
b. Availability of a Receiver
c. Availability of a transmission medium
d. Availability of response from the receiver.
e. Availability of a set of protocols that governs the communication.

iii. Briefly describe, what is communication channel? **(2 marks)**

The path through which the communication takes place is called a **communication channel**

iv. List the Key Elements of a Communication System. **(1 X 6 =06 marks)**

i. Source
ii. transmitter
iii. protocols
iv. medium
v. destination
vi. receiver

v. The direction of data flow between two devices can take place in three modes. Briefly describe them by giving suitable example for each of them.

(2 X 3 =06 marks)

Simplex
(Unidirectional Communication) Transmission takes place only in one direction all the time.
e.g. Radio / TV broadcasting
Half Duplex
Transmits in both directions but in one direction at a time.
e.g. Walkie -Talkies
Full Duplex
Transmits data in both directions at the same time. *(Use two channels forward and backward)*
E.g. Telephone

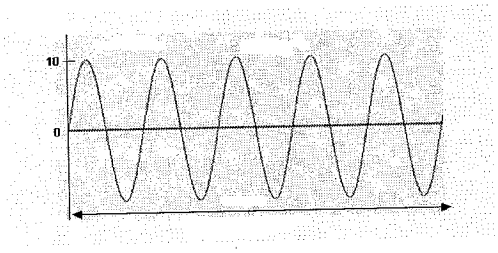
Q2.

i. Compare and contrast the analog signals and digital signals? **(04 marks)**

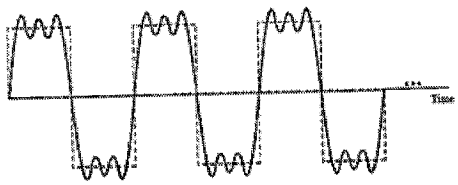
Analog Signal	**Digital Signal**
Expensive	Cheap
Susceptible to noise	Less Susceptible to noise
Low attenuation	High attenuation
Distortion not so effective	Distortion is effective

ii. Periodic analog signals can be classified as simple signal and composite signal. What are the differences between simple signal and composite signal? (Hint : You may use diagrams to illustrate this.) **(04 marks)**

i. A simple analog signal, **Sine wave** cannot be decomposed into simpler signals.
ii. A composite periodic analog signal is composed of multiple sine waves.



simple signal



composite signal (any suitable drawing)

iii. Shifting a sine wave to left can be given as an equation. By observing the following equation identify the symbols associated with it.
(All Correct 03 marks, 04 correct 02 marks, less than 04 correct no marks))

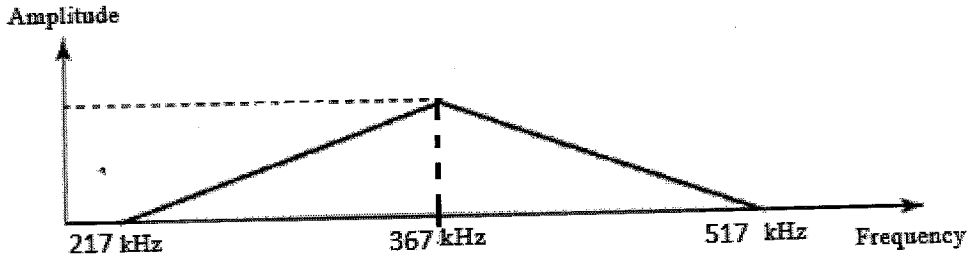
$$s(t)=A \sin(\omega t - \theta)$$

s- displacement
A - Amplitude
ω- Angular velocity
θ – Phase Difference
t- time

iv. The power supply voltage signal to household is a good example of a simple sine wave. The maximum amplitude is approximately 155 volts and frequency is 60Hz. Write the mathematical expansion and find the instantaneous value of the signal at time t. **(03 marks)**

$S(t) = 155 \sin(120 \pi t)$

v. A nonperiodic composite signal has a bandwidth of 300 kHz, with a middle frequency of 367 kHz and peak amplitude of 20 V. The two extreme frequencies have an amplitude of 0. Draw the frequency domain of the signal. **(03 marks)**



vi. Assume we need to download text documents at the rate of 100 pages per minute. What is the required bit rate of the channel? A page is an average of 24 lines with 80 characters in each line. You may assume that one character requires 8 bits. **(03 marks)**

Bit rate = (100 X 24 X 80 X 8) / 60 =25600 bps

Q3.

i. Communication media can be classified into two categories. Name them by supplying suitable examples. **(03 marks)**

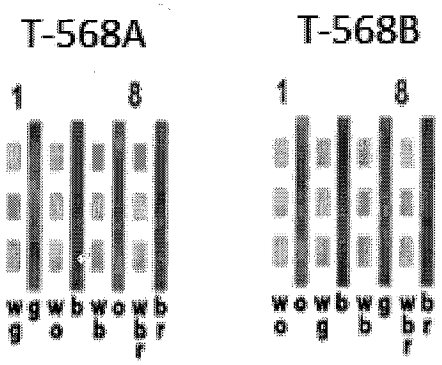
a. Guided Media/Wired Media:
   i. Twisted Pair
   ii. Coaxial Cable
   iii. Optical Media
b. Unguided Media/ Wireless Media
   i. Radio
   ii. Microwave
   iii. Infrared

ii. What are the category types in UTP cable? **(03 marks)**

CAT3,CAT5 & CAT5e

iii. Using Suitable diagram show the color codes of two ends in cross over cable.

(04 marks)



iv. Which pair of devices can be connected using crossover cable for communication purposes? List 03 pair of them. **(03 marks)**

- Switch to switch
- Switch to hub
- Hub to hub
- Router to router
- PC to PC
- Router to PC

v. Name 03 wireless transmission waves. **(03 marks)**

Radio Wave, Microwave, Infrared

vi. Considering a network with 8 devices, evaluate the number of cable links required for a mesh topology. **(04 marks)**

Number of cables =n(n-1)/2
=8(8-1)/2
=28

Q4.

i. What do you mean by "Protocol"? List 04 protocols used in TCP (Transmission Control Protocol) **(03 marks)**

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

a. FTP (File Transfer Protocol)
b. HTTP (Hypertext Transfer Protocol)
c. SMTP (Simple Mail Transfer Protocol)
d. Telnet

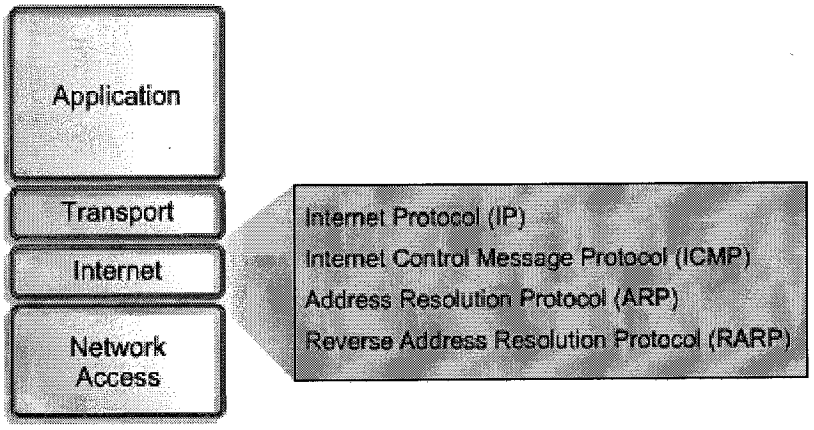
ii. Name four levels of addresses are used in internet employing the TCP/IP protocols?

(02marks)

Physical Addresses
Logical(IP) Addresses

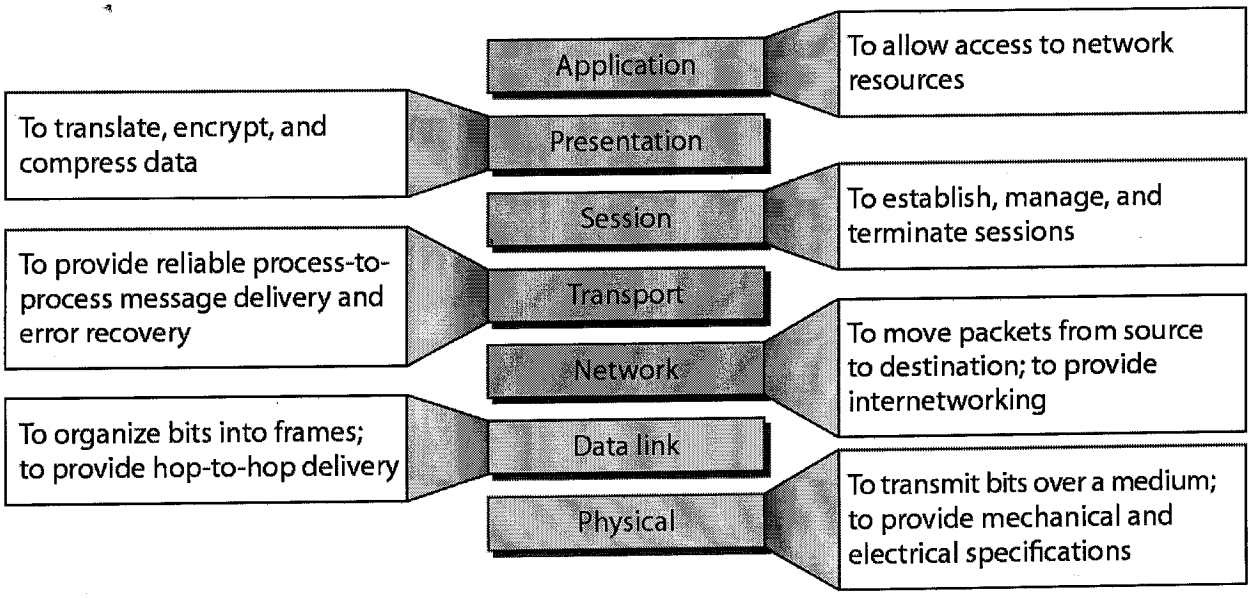
Port Addresses,
Specific Addresses.

iii. The TCP/IP model has the four layers. Represent it diagrammatically by mentioning the protocols available in internet layer. **(03 marks)**



iv. List the 07 layers available in OSI Model. State the functions of each layers in OSI Model. **(07 marks)**

Application. Presentation, Session, Transport, Network, Data Link, Physical



v. What are the advantages of layered architecture? **(05 marks)**

a. It breaks network communication into smaller, more manageable parts.
b. It standardizes network components to allow multiple vendor development and support.
c. It allows different types of network hardware and software to communicate with each other.
d. It prevents changes in one layer from affecting other layers.

e. It divides network communication into smaller parts to make learning it easier to understand.

Q5.

i. There are two formats for referencing an IP address. Name those. **(02 Marks)**

a. Binary
b. Dotted decimal notation

ii. What are the functionalities of DNS? Write the required command to view the IP address of the given url. Given url : www.sliate.ac.lk **(03 marks)**

i. The DNS translates the IP address into the domain name and domain name into the IP address.
ii. The list of the IP addresses and the domain names are distributed throughout the internet.

C:\>nslookup www.sliate.ac.lk

iii. Identify the difference(s) between "Classful IP addresses" and "Classless IP addresses". **(04 marks)**

- Subnet masks that contain all ones or all zeros in an octet are called **classful subnet masks**
- A **classless subnet mask can** have a mix of zeros and ones in one octet.

iv. Answer the following question by using the given IP address 168.173.70.134/29

a.	Class of the host IP address	Class B	**(02 marks)**
b.	Subnet mask	255.255.255.248	**(01 marks)**
c.	Network IP	168.173.70.128	**(02 mark)**
d.	First host IP	168.173.70.129	**(01 mark)**
e.	Last host IP	168.173.70.134	**(01 mark)**
f.	Available hosts	06	**(02 marks)**
g.	Broadcast address of the subnet	168.173.70.135	**(02 marks)**

Q6.

i. Identify the difference between network security and internet security. **(04 marks)**

Network Security - measures to protect data during their transmission

Internet Security - measures to protect data during their transmission over a collection of interconnected networks

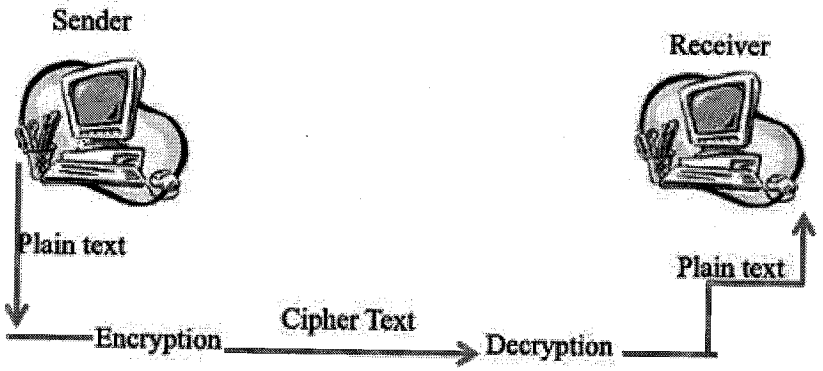
ii. Network security is mostly achieved through the use of cryptography. What do you mean by cryptography? **(02 marks)**

The science and art of transforming messages to make them secure and immune to attack.

iii. Cryptography can provide several aspects of security related to the interchange of messages through networks. List those aspects. **(02 marks)**

confidentiality, integrity, authentication, and no repudiation

iv. Give pictorial representation of cryptography components. **(03 marks)**



v. Compare and contrast Symmetric Key Cryptography and Asymmetric Key Cryptography. **(06 marks)**

Symmetric Key Cryptography	Asymmetric-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	• 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.

vi. Use the shift cipher with key = 14 to encrypt the message "HELLO WORLD". **(03 marks)**

Ans:
VSZZC KCFZR