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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS**

**MARCH/APRIL 2016 EXAMINATION**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**COURSE CODE: CIT303**

**COURSE TITLE: Principles of Communication Technology**

**Time: 3 hrs.**

**Course Credit Unit: 3**

**Instruction: Attempt any five (5) questions. Each question carries 14 marks**

**Question 1**

a) Outline the layers of Open System Interconnection Reference Model (OSI Model), in the right order.

b) Write briefly on the Physical Layer.

c) Cryptography algorithms (ciphers) can be divided into two groups, True or False? If True;

1. Write briefly on any of the two groups

**Question 2**

1. With the aid of a table ONLY, describe the five classes of IP addresses under the following fields:
2. IP Address Class

ii. Format

iii. Purpose

iv. Number of network/ host bits

v. Max number of hosts

( 7.5 marks)

b. Briefly explain each of the following terms:

i. Linear filter (1 mark)

ii. Stable filter (1 mark)

iii. Unstable filter (1 mark)

iv. Time-invariant filter (1 mark)

v. Adaptive filter (1 mark)

vi. Linearity (in the context of linear-time invariant (LTI) (1.5 marks)

**Question 3**

a. Encrypt the word “IGNORANCE” with the following ciphers:

i. Shift cipher with key=1 (1 mark)

ii. Shift cipher with key= 26 (1 mark)

iii. Shift cipher with key=0 (1 mark)

iv. Transposition cipher where plain text: 1 2 3 4 5 6 7 8 9 and

cipher text: 4 3 1 5 2 6 7 9 8 (with no bogus character) (1.5 marks)

b. Decrypt the word “ANCEIGNOR” with the following ciphers:

xx. Shift cipher with key=1 (1 mark)

xxi. Shift cipher with key= 26 (1 mark)

xxii. Shift cipher with key=0 (1 mark)

xxiii. Transposition cipher where plain text: 1 2 3 4 5 6 7 8 9 and

cipher text: 4 3 1 5 2 6 7 9 8 (with no bogus character) (1.5 marks)

c. The amplification in a cable is usually defined in decibels per kilometer (dB/km). If the signal at the beginning of a cable with 2 dB/km has a power of 2 mW, what is the power of the signal at 5 km? (2.5 marks)

d. Briefly explain the term attenuation (1.5 marks)

**Question 4**

a) What is Data Communications? (3 marks)

b) Define Protocols. (3marks)

c) The effectiveness of a data communications system depends on four fundamental characteristics. List and define these characteristics. (8 marks)

**Question 5**

Contrast between:

1. Analog Signal Processing and Digital Signal Processing (4.5 marks)
2. OSI Presentation Layer and OSI Application Layer (5 marks)
3. Symmetric-Key and Asymmetric-Key (4.5 marks)

**Question 6**

1. Define the term “network topology”. (1 mark).
2. With the aid of diagrams, briefly explain the following network topologies:
   * + - 1. Ring (2 marks)
         2. Mesh (2 marks)
         3. Tree (2 marks).
3. State and briefly explain 3 advantages and 3 disadvantages of using fiber optic cables in networking. (4.5 marks)
4. State 1 advantage and 2 disadvantages of STP cables in comparison to UTP cables. (2.5 marks)