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SCHOOL OF ENGINEERING SCIENCES

FIRST SEMESTER EXAMINATIONS: 2016/2017

LEVEL 300: BACHELOR OF SCIENCE IN ENGINEERING

CPEN 305: COMPUTER NETWORKS [*3 Credits*]

INSTRUCTIONS: **Time Allowed: 3 Hours**

Attempt ***ALL*** questions

All abbreviations have their usual meaning.

QUESTION 1

a. Why are the wires twisted in twisted-pair copper wire? **[2 Marks]**

b. Explain three major limitations of twisted-pair wire? **[6 Marks]**

c. What is the difference between unshielded twisted pair and shielded twisted pair? **[4 Marks]**

d. Describe the components of an optical fiber cable. **[6 Marks]**

e. A TCP segment consisting of 1500 bits of data and 160 bits of header is sent to the IP layer, which appends another 160 bits of header. This is then transmitted through two networks, each of which uses a 24-bit packet header. The destination network has a maximum packet size of 800 bits. How many bits, including headers, are delivered to the network layer protocol at the destination? **[7 Marks]**

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QUESTION 2

a. Given a channel with an intended capacity of 20 Mbps, the bandwidth of the channel is 3 MHz. Assume white thermal noise is added to the transmitted signal. What value of signal-to-noise ratio is required to achieve this capacity? **[4 Marks]**

b. In a class A subnet, we know the IP address of one of the hosts and the subnet mask as given below:

IP Address: 25.34.12.56 **Subnet mask: 255.255.192.0**

i. What is the first address (subnet address)?

ii. What is the last address?

[4 Marks]

c. In a class C subnet, we know the IP address of one of the hosts and the subnet mask as given below:

IP Address: 202.44.82.116 **Subnet mask: 255.255.255.240**

i. What is the first address (subnet address)?

ii. What is the last address?

[4 Marks]

d. In a block of addresses, we know the IP address of one host is 25.34.12.56/16.

i. What is the first address (network address) in this block

ii. What is the last address (limited broadcast address) in this block?

[6 Marks]

QUESTION 3

a. An organization is granted the block 130.56.0.0/16 . The administrator want to create 1024 subnets

i. Find the subnet mask

ii. Find the number of addresses in each subnet

iii. Find the first and the last address in the first subnet

iv. Find the first and the last address in the last subnet (subnet 1023)

[10 Marks]

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b. Describe the following switched WAN technologies.

i. X25

ii. ATM

iii. Frame Relay

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[9 Marks]

QUESTION 4

a. Explain the difference between symmetric encryption and public-key encryption.

[4 Marks]

b. Explain the differences among the terms public key, private key, secret key?

[4 Marks]

c. List and briefly describe three encryption or security algorithms used under the Secure Sockets Layer (SSL) protocol [6 Marks]

d. What is the difference between passive and active security threats? [4 Marks]

e. Compare UDP, TCP and SCTP [6 Marks]