**RAJARATA UNIVERSITY OF SRI LANKA**
**FACULTY OF APPLIED SCIENCES**
**B.Sc. (General) Degree in Applied Sciences**
**Third Year Semester II Examination - October 2013**

# COM3401 – DATA COMMUNICATION AND NETWORKING

Answer **any five** questions Time: **3 hours**

1).

a) What are the elements of data communication model? Explain them with the help of a diagram.

[3 marks]

b) Communication systems and networks are modeled as layered architectures. Describe the advantages of using a layered architecture for modeling communication systems and networks.

[4 marks]

c) List down all the layers in the ISO/OSI protocol stack and briefly describe the functions and responsibilities of each layer.

[10 marks]

d) Compare the OSI and TCP/IP models considering their similarities and differences.

[8 marks]

**[Total: 25 marks]**

2).

a) What are the **two** primary types of media used in data transmission? Provide at least two examples for each type.

[6 marks]

b) Give **one** example for each of the following communication modes:

i. Simplex
ii. Half-duplex
iii. Full-duplex

[3 marks]

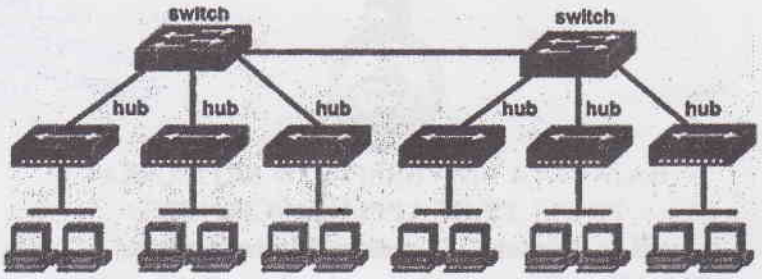
c) Briefly explain **three** properties of signals using diagrams.

[6 marks]

d) What is meant by the **bandwidth** of a medium? Explain.

[4 marks]

e) Explain the concept of collision domains in a network setup using multiple levels of switches and hubs as shown in the following diagram?




[6 marks]

**[Total: 25 marks]**

3).

a) Why do you need error handling in data communication? Briefly explain **two** types of errors that could occur during data transmission.

[5 marks]

b) Describe simple parity-check code used in error handling. Can it be used for error correction? Explain your answer.

[8 marks]

c) Briefly discuss stop-and-wait flow control. Use diagram to explain.

[8 marks]

d) What is meant by Congestion Control?

[4 marks]

**[Total: 25 marks]**

4).

a) Explain the following network topologies with the help of diagrams.

i. Bus
ii. Star
iii. Ring
iv. Mesh

[6 marks]

b) Compare and contrast the following two types of services offered by a network

i. Connectionless
ii. Connection-oriented

(Hint: Describe the differences, advantages and disadvantages of each scheme)

[8 marks]

c) Briefly describe different types of switched networks.

[6 marks]

d) What is multiplexing in data communication? Briefly explain.

[5 marks]

**[Total: 25 marks]**

5).

a) The transport layer use **port numbers** for its proper functionality. Explain briefly what a **port number** is and why it is necessary to have them.

[5 marks]

b) Write short notes on the following aspects of a TCP/IP implementation:
   i. Address Resolution Protocol (ARP)
   ii. Domain Name System (DNS)
   iii. Routing
   iv. Fragmentation (and Re-assembly)

[12 marks]

c) Briefly describe the use of any **six** fields of the TCP header. The fields of the TCP header are given in **Figure 1**. Consider the URG, ACK, PSH, RST, SYN, and FIN as a single field named "flags".

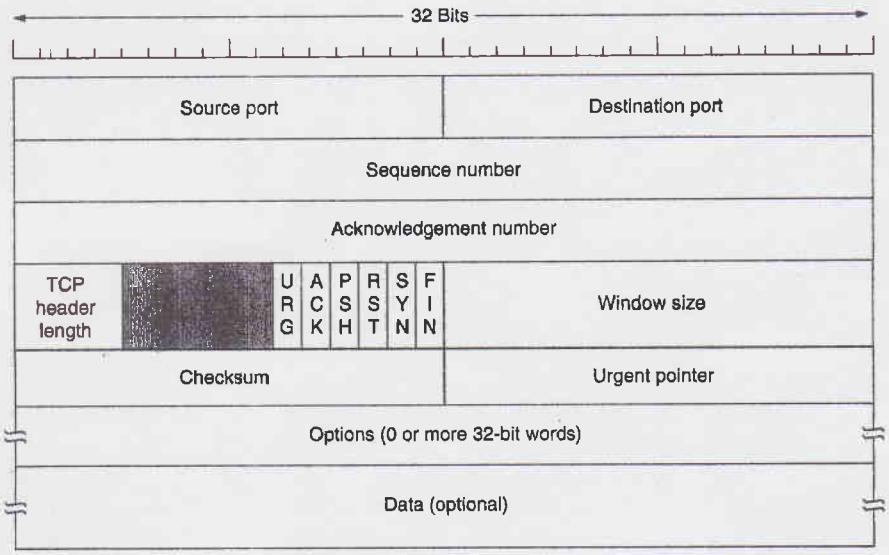



**Figure 1 –** TCP segment header

[8 marks]

**[Total: 25 marks]**

6).

a) Briefly describe different types of addresses used in different layers of TCP/IP protocol stack.

[6 marks]

b) The IPv4 block of 10.96.4.0/24 is given to you to be divided into eight equal-sized subnets. Based on this answer the following:
   i. What is the subnet mask of the sub networks?
   ii. How many usable host addresses will be available in each of these networks?
   iii. Write down the eight sub networks.
   iv. Write the broadcast address for each of the networks in (ii)

(Hint: Include your workings on deriving the network addresses and subnet masks)

[12 marks]

c) What is Variable Length Subnet Masking (VLSM)?

[4 marks]

d) What is Dynamic Host Configuration Protocol (DHCP)?

[3 marks]

**[Total: 25 marks]**