UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: July 2017

Module Number: EE5302 **Module Name: Computer Networks**

[Three Hours]

[Answer **all questions**, each question carries ten marks]

Q1 a) List two ways in which the OSI and the TCP/IP reference models are similar and two ways in which they are differed.

[2.0 Marks]

b) Identify, which of the OSI layers handles following functions?

i) Transmitting raw bits over a communication channel.

[0.5 Marks]

ii) How to keep a fast transmitter from drowning a slow receiver in data.

[0.5 Marks]

iii) Concerned with the syntax and semantics of the information transmitted.

[0.5 Marks]

iv) Controls the operation of the subnet.

[0.5 Marks]

c) A host on a LAN wishes to send the following bit stream: 0001110101. Sketch the bit stream with following encoding methods.

i) Non-Return to Zero Inverted (NRZI).

[1.0 Mark]

ii) Manchester.

[1.0 Mark]

d) What are the drawbacks of message switching? Illustrate, how is it overcome in packet switching?

[2.0 Marks]

e) Compute the maximum bit rate and appropriate signal levels for a channel having bandwidth of 1600 Hz under the following Signal to Noise Ratios (SNR).

i) 10 dB.

[1.0 Mark]

ii) 20 dB.

[1.0 Mark]

Q2 a) State three major advantages of using Virtual Local Area Network (VLAN) and briefly describe the usage of "Native VLAN".

[2.0 Marks]

b) A bit string of "0111101111101111110" needs to be transmitted at the data link layer. Write the bit string actually transmitted after bit stuffing?

[1.0 Mark]

c) Consider the delay of pure ALOHA versus slotted ALOHA at low load (i.e., when there are very few stations trying to send). Which one is less delay? Explain your answer.

[1.0 Mark]

d) Explain the technique of "pipelining" used in the sliding window protocol.

[2.0 Marks]

e) Station *A* uses 32 byte packets to transmit messages to station *B* using a sliding window protocol. The round trip delay between *A* and *B* is 80 milliseconds and the bandwidth on the path between *A* and *B* is 128 kbit/s. Calculate the optimal window size that *A* should use?

[2.0 Marks]

f) Station *A* needs to send a message consisting of 9 packets to station *B* using the Go-Back-3 (GB3) flow control strategy. Assume that all packets are ready and immediately available for transmission. If every 5th packet that *A* transmits gets lost (but no acknowledgement (acks) from *B* ever get lost), then what is the number of packets that *A* should transmit for sending the message to *B*?

[2.0 Marks]

Q3. a) Describe the terms Sub-netting and Variable Length Subnet Mask (VLSM) with examples.

[2.0 Marks]

b) Explain the purpose of fixed header and extended headers in IPv6.

[2.0 Marks]

c) Your ISP has provided you a serial connection to their network. They have provided the interface at your end of the serial connection with the IP address of 16.32.96.109/30. For this situation, you must supply the IP address of the ISP's interface at the opposite end of the serial connection as your gateway. Find an IP address that can be assigned to the gateway?

[2.0 Marks]

d) Descried the "Split Horizon", "Route Poisoning" and "Administrative distance" using suitable examples.

[3.0 Marks]

e) You get a call from a network administrator who tells you that he typed the following commands into the router:

```
Router(config)# router ospf 1
Router(config-router)# network 10.0.0.0 255.0.0.0 area 0
```

He tells you he still can't see any routes in the routing table. Identify the configuration error that the administrator did and explain how you correct it?

[1.0 Mark]

Q4. a) Why Transmission Control Protocol (TCP) is called an end-to-end protocol?

[2.0 Marks]

b) Explain the difference between the TCP and User Datagram Protocol (UDP) header format using a diagram.

[2.0 Marks]

c) Explain possibility of losing data in "Three-Way Handshake" mechanism used by TCP to terminate a session.

[2.0 Marks]

d) Solve the problem in part c), by giving proof for the vulnerability of your solution.

[2.5 Marks]

e) What is the purpose of TCP/UDP port numbers? Describe what are the well-known ports, the registered ports and the dynamic/private ports?

[1.5 Marks]

Q5. a) The protocols HTTP, SMTP and FTP are used in application layer. From these three protocols which one uses the out-of-band signaling?

[1.0 Mark]

b) Suppose you are sending an email from your Hotmail account to your friend, who reads his/her e-mail from his/her mail server using IMAP. Briefly, describe how your email travels from your host to your friend's host. Name the application layer protocols involved for the above process?

[2.5 Marks]

c) Explain the difference between the concepts "Authentication" and "Authorization" in computer security?

[2.0 Marks]

d) We want to design a secure mutual authentication protocol between Alice and Bob using shared "symmetric key". Design such protocol that uses three messages and illustrate the designed protocol using a diagram.

[2.5 Marks]

e) Illustrate how Trudy attacks the authentication between Alice and Bob, when they use the "asymmetric key" based authentication.

[2.0 Marks]