

**University of Swaziland  
Faculty of Science  
Department of Electrical and Electronic Engineering  
Main Examination 2016**

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**Title of Paper : Computer Networks**

**Course Number : EE572**

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**Time Allowed : 3 hrs**

**Instructions :**

- 1. Answer any four (4) questions**
- 2. Each question carries 25 marks**
- 3. Useful information is attached at the end of the question paper**

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BEEN GIVEN BY THE INVIGILATOR**

**The paper consists of five (5) pages**

### Question 1

- (a) ARP and RARP both map addresses from one space to another. In this respect, they are similar. However, their implementations are fundamentally different. In what major way do they differ? [2]
- (b) Many companies have a policy of having two (or more) routers connecting the company to the Internet to provide some redundancy in case one of them goes down. Is this policy still possible with NAT? Explain your answer. [3]
- (c) A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle? [2]
- (d) Besides bandwidth and latency, what other parameter is needed to give a good characterization of the quality of service offered by a network used for digitized voice traffic? [2]
- (e) Describe in detail the packet switching and message switching technique? [8]
- (f) The CSMA/CA sometimes called multiple access with collision avoidance (MACA) is employed by wireless LANs since the sensing part is based on sensing the activity around the intended receiver. Given the scenario below (Figure 1, a and b) explain briefly what is taking place to show how the protocol works within wireless LANs in order to avoid collision. [4]

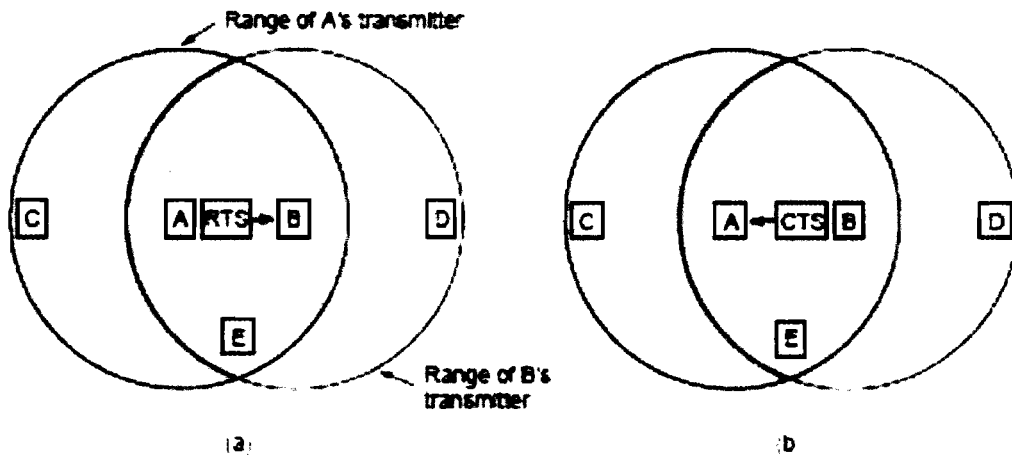
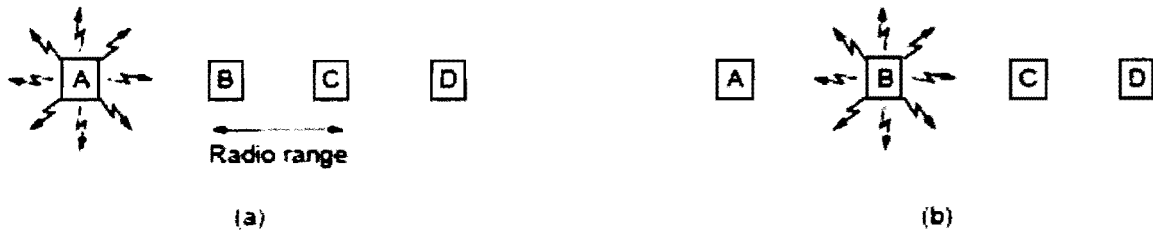


Figure 1

- (g) Explain the Remote Procedure Calls (RPC) in the application layer client-server model. [4]

## Question 2

- (a) The CSMA/CD cannot work in wireless LANs due to two problems



- (i) Hidden Station problem (refer to figure a) [3]  
(ii) Exposed Station Problem (refer to figure b) [3]

**Briefly describe each of the problems using illustration if possible.**

- (b) What are two reasons for using layered protocols? [2]
- (c) An image is 1024 x 768 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? Over a 1-Mbps cable modem? Over a 10-Mbps Ethernet? [3]
- (d) Your ISP has given you the address 223.5.14.6/29 to assign to your router's interface. They have also given you the default gateway address of 223.5.14.7. After you have configured the address, the router is unable to ping any remote devices. What is preventing the router from pinging remote devices? (Show how you arrive at your solution) [2]
- (e) What is an important difference between the symmetric and public key systems? [4]
- (f) Suppose  $N$  people want to communicate with each of  $N-1$  other people using symmetric key encryption. All communication between any two people,  $i$  and  $j$  is visible to all other people in the group of  $N$ . How many keys are required in this system? If public key encryption is used, how many keys are required? [3]
- (g) Design an access list that denies IP traffic from hosts 152.5.35.83 and 104.2.64.33, permits IP traffic from all hosts on network 185.25.0.0/16, and denies all other IP traffic. Invoke your access list inbound on interface E2. [5]

## Question 3

- (a) What is a man-in middle attack? Can this occur when symmetric keys are used? [3]
- (b) Refer to Figure 2 below. A network administrator attempts to ping Host 2 (PC2) from Host 1 (PC1) and receives the results that are shown. What might be the

possible problem? Explain your solution, that is, the one you choose in the options below and also explain why the others are wrong (explain each option)? [10]

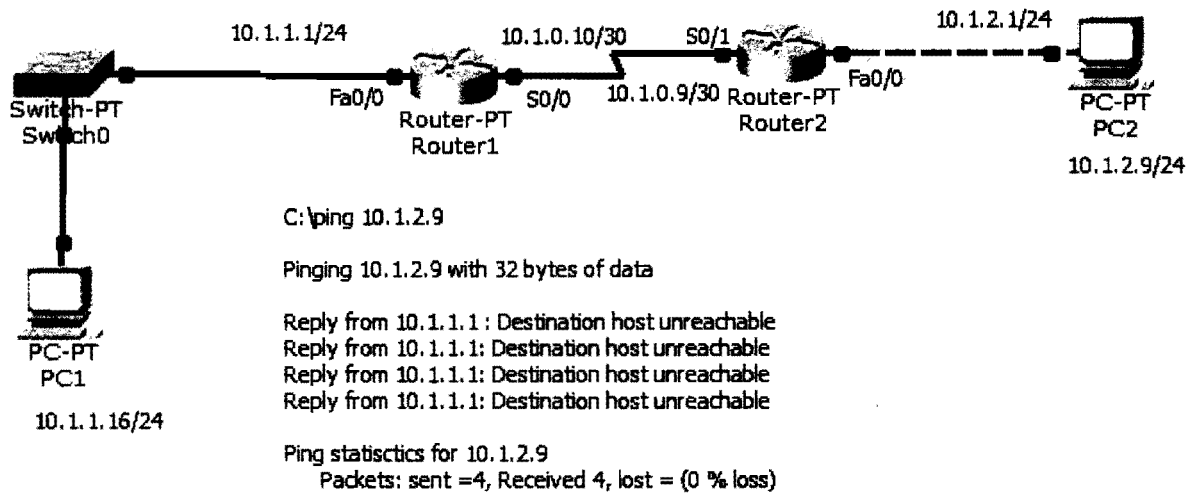


Figure 2

The options are as follows:

- A. The link between PC1 and Switch 0 is down
  - B. The TCP/IP is not functioning on PC1
  - C. The link between Router 1 and Router 2 is down
  - D. The default gateway on PC1 is incorrect
  - E. The link between Switch 0 and Router 1 is down
- (c) Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less? Explain your answer [3]
- (d) A large number of consecutive IP address are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w. x. y. z/s notation [4]
- (e) Explain the following terms, congestion control and flow control. What are the congestion control techniques employed by the transport layer (list 3 of them). [5]

**Question 4**

- (a) Describe the packet flow, assuming that a user wants to access [www.Amazon.com](http://www.Amazon.com) from her personal computer. She has an internet connection from her ISP. [10]
- (b) Figure 3 below shows congestion in virtual circuits. When setting up a virtual circuit make sure congestion can be avoided, that is, one of the basic principles. Explain the techniques employed in virtual circuits to avoid congestion. [3]

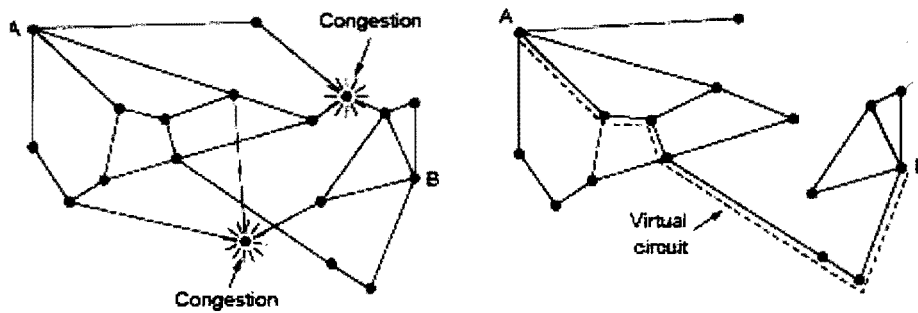


Figure 3

- (c) Explain the limitations factors and issues regarding IPv4 [8].
- (d) Imagine that a two-way handshake rather than a three-way handshake were used to set up connections. In other words, the third message was not required. Are deadlocks now possible? Give an example or show that none exist [2]
- (e) Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets? [2]

**Question 5**

- (a) What command is used to copy the configuration from RAM into NVRAM? [2]
- (b) There are no boot system commands in a router configuration in NVRAM. What is the fall back sequence that router will use to find an IOS during reload? [1]
- (c) Differentiate between Domain Name Service (DNS) and Hyper Text Transfer Protocol (HTTP). [6]
- (d) Closed-loop congestion control mechanisms try to alleviate congestion after it happens. Several mechanisms have been used by different protocols. State (6 of them) and describe each of the mechanism used. [16]