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MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

FORTH YEAR FIRST SEMESTER REGULAR EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: BCS 313

COURSE TITLE: COMPUTER NETWORKS

DATE: 13/12/2022 **TIME:** 8:00-10:00am

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and choose any other Two.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

SECTION A [COMPULSORY]

QUESTION ONE [30 MARKS]

a. Why are standards important for protocols? [2 Marks]
b. With regard to the OSI service model, explain the two advantages of layering the protocols. [4 Marks]
c. What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers? [5 Marks]
d. Skype offers a service that allows you to make a phone call from a PC to an ordinary phone. This means that the voice call must pass through both the Internet and through a telephone network. Discuss how this might be done. [4 Marks]
e. Describe why an application developer might choose to run an application over UDP rather than TCP. [2 Marks]
f. Fast retransmit is implemented for reliable data transfer. Give a brief description of how it is implemented. [3 Marks]
g. Describe how the following are implemented in a TCP network: flow control, congestion control and reliable data transfer. [6 Marks]
h. What is the difference between routing and forwarding? [2 Marks]
i. Compare and contrast link-state and distance-vector routing algorithms. [2 Marks]

QUESTION TWO [20 MARKS]

a) The designers of TCP made use of two special numbers while implementing aspects of reliable data transfer. Name and describe the two numbers and how they are implemented by TCP to promote reliability as mentioned. [7 Marks]

b) Which layers in the Internet protocol stack does a router process? Which layers does a link-layer switch process? Which layers does a host process? [4 Marks]

c) What are some of the possible services that a link-layer protocol can offer to the network layer? Which of these link-layer services have corresponding services in IP? In TCP? [6 Marks]

d) How does the datalink layer implement its error detection and correction mechanism? Briefly describe? [3 Marks]

QUESTION THREE [20 MARKS]

a) We have said that an application may choose UDP for a transport protocol because UDP offers finer application control (than TCP) of what data is sent in a segment and when. a. Why does an application have more control of what data is sent in a segment? b. Why does an application have more control on when the segment is sent? [5 Marks]

b) Compare and contrast the advertisements used by RIP and OSPF. [2 Marks]

c) HTTP is said to be a pull protocol while SMTP is said to be a pull protocol. Describe the difference? [2 Marks]

d) When implementing email in the internet, a number of protocols are used. With the aid of a diagram, describe the IMAP, POPv3 in terms of how it is implemented in the mail system.

e) Some switches are said to be intelligent and self-learning. How are they able to do this in a network? [3 Marks]

f) Secure socket layer and Transport Layer security are some of the security functions implemented in the network. Briefly describe the two protocols and explain how they are implemented within the OSI model. [8 Marks]

QUESTION FOUR [20 MARKS]

a) Compare and contrast link-state and distance-vector routing algorithms. [4 Marks]

b) Describe how the DNS system is implemented in networks. [3 Marks]

c) Consider sending an IP datagram from Host E to Host F. Will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses? [6 Marks]

d) Describe the slowstart probability that is implemented in the CSMA/CD. [3 Marks]

e) Define the ICMP protocol and briefly explain how it is implemented in networks. [1 Marks]

f) Differentiate between a hub and a bridge? Why is a switch better than both? [3 Marks]

FQUESTION FIVE [20 MARKS]

a) Use a diagram to describe the OSI model while giving an example of one protocol and the type of packet transfer that is applied in each of the seven layers. [7 Marks]

b) What is encapsulation? How is it applied in the 7 layer OSI model? [4 Marks]

c) How big is the MAC address space? The IPv4 address space? The IPv6 address space? [3 Marks]

d) Suppose nodes A, B, and C each attach to the same broadcast LAN (through their adapters). If A sends thousands of IP datagrams to B with each encapsulating frame addressed to the MAC address of B, will C's adapter process these frames? If so, will C's adapter pass the IP datagrams in these frames to the network layer C? How would your answers change if A sends frames with the MAC broadcast address? [6 Marks]