KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, SECOND SEMESTER EXAMINATION
FOR THE DIPLOMA IN INFORMATION & COMMUNICATION TECHNOLOGY
DIT 1010 – DATA COMMUNICATIONS & NETWORKS

Date: 13TH December 2024
Time: 2:30PM – 4:30PM

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS
QUESTION ONE (30 MARKS)

a) The IT department at a local business is setting up a new network and needs to differentiate between basic network types. Define LAN, WAN, and explain their key differences.

(2 Marks)

b) A network technician is troubleshooting issues related to data transmission. Highlight three data transmission modes (3 Marks)

c) Using a diagram, explain the three ways handshake as used by TCP (3 Marks)

d) A network engineer is evaluating various components for a communication system. Describe three key components of a communication system. (3 Marks)

e) A training seminar introduces participants to the OSI and TCP/IP models. List the seven layers of the OSI model in order from layer 1 upwards. (3 Marks)

f) An internet protocol address (IP address) is a numerical label assigned to each device connected to a computer network that uses the internet protocol for communication.
   i. Describe the term Addressing and subnetting (2 Marks)
   ii. Given the router address 212.100.50.0 with a host requirement of 75, find;
      a. The number of subnets (3 Marks)
      b. Total usable addresses (2 Marks)
      c. 40th host address (1 Mark)

g) A student intern is learning about common error detection methods in data communication. Define CRC (Cyclic Redundancy Check) and explain its role in error detection.

(2 Marks)

h) A business is transitioning to IPv6 for better scalability. Explain the difference between IPv4 and IPv6.
(2 Marks)

i) An intern is tasked with setting up protocols for a small office network. Define HTTP and DNS and briefly describe their roles in network communication. (2 Marks)

j) In a meeting about future network management strategies, the network administrator discusses Software-Defined Networking (SDN). Discuss the concept of SDN and how it enhances network management compared to traditional architectures. (2 Marks)

QUESTION TWO (20 MARKS)

a) In a networking seminar, a student asks about TCP and UDP. Compare and contrast TCP and UDP protocols, discussing scenarios where one would be preferred over the other.

(3 Marks)

b)   A network engineer is analyzing routing algorithms. Analyze the differences between distance vector and link state routing algorithms.   (2 Marks)
c)   A technician is tasked with evaluating different data transmission methods for a home network. Highlight three types of guided media that the technician can consider.   (3 Marks)
d)   A team is evaluating different network topologies for a new office layout. Using a diagram, describe three network topologies of your choice and evaluate two advantages and disadvantages of network topologies.   (12 Marks)

QUESTION THREE (20 MARKS)
a)   A company is considering upgrading its network infrastructure. Compare wired and wireless network technologies in terms of performance and security.   (4 Marks)
b)   During a network setup, a technician is discussing error control mechanisms with colleagues. Explain the difference between flow control and error control mechanisms at the data link layer.
                                                                                                    (3 Marks)
c)   An IT manager is reviewing the importance of the OSI model with their team. Describe is the functions of each layer of the OSI model in network design.   (7 Marks)
d)   A network engineer is tasked with implementing IP addressing in an international company with multiple branches. Compare the role of routers and switches in managing traffic at the network and data link layers.   (3 Marks)
e)   A small retail store wants to set up a new network. Draw a diagram illustrating a simple Local Area Network (LAN) for the store, including hardware and topology.   (3 Marks)

QUESTION FOUR (20 MARKS)
a)   An investigation follows a network security breach. Analyze a network security breach case study and identify the factors that contributed to it.   (5 Marks)
b)   A project manager discusses network speed versus reliability with the team. Discuss the trade-offs between network speed and reliability in data transmission.   (5 Marks)
c)   A cybersecurity audit is being conducted. Evaluate the effectiveness of various network security measures against malware and DoS attacks.   (4 Marks)
d)   A security team is reviewing encryption practices. Evaluate different encryption methods used in securing network communication.   (6 Marks)

QUESTION FIVE (20 MARKS)
a)   A telecommunications company is evaluating new technologies. Evaluate the impact of 5G technology on data communication and networking.   (4 Marks)
b)   Assume that you are the Administrator of your organization and you are asked by the management to define the security measures undertaken to secure your data, how would you go about solving the problem?   (8 Marks)
c)   A small public relations firm leases two groups of offices in Building A and Building C of a suburban office park. The business staff, including human resources and accounting has 12 people and is located in two offices in building A. The creative staff, including copy writing, graphics and production, with a total of 22 employees, is in Building C. Building A and Building C are about 600 metres apart. The business staff is networked with a coaxial bus that ties their computers in a peer-to-peer workgroup. The creative staff in Building C has a conglomeration of computers including Apple Macintoshes and personal computer - compatibles. They are not networked. The owners of the company would like to network all of the computers for the creative staff, and connect the creative staff network to the business staff network. They would also like to standardize on the type of network used in both buildings to keep troubleshooting issues to a minimum Suggest a network solution to the owners and give a rationale to your decisions.   (8 Marks)