Republic of Rwanda
City of Kigali

GASABO DISTRICT

DISTRICT COMPREHENSIVE ASSESSMENT, RTQF LEVEL... 2023-2024

SECTOR: ICT & MULTIMEDIA

TRADE: SOFTWARE DEVELOPMENT

MODULE CODE: GENBN401

MODULE NAME: BASICS OF NETWORKING

DATE OF EXAM: 18/3/2024

DURATION: 3HOURS

SCHOOL YEAR: 2023-2024

TERM: 2

Instructions:

1. **Attempt all questions in section A** **(55 Marks)**
2. **Attempt three questions in section B** **(30 Marks)**
3. **Attempt one question in section C** **(15 Marks)**

SECTION A

1. **What is a network and what are its components? /5Marks**

Answer: A network is a collection of interconnected devices such as computers, servers, routers, and switches that can communicate and share resources with each other. Components of a network include computers, servers, routers, switches, and other devices.

2. **Describe the Internet and its significance. /5Marks**

Answer: The Internet is a global network of interconnected computer networks spanning the entire planet. It enables the exchange of information and communication among billions of devices worldwide. The Internet facilitates data sharing, resource sharing, and services across the globe, playing an integral role in modern life.

3. **What is a LAN and how does it differ from a WAN? /5Marks**

Answer: A LAN (Local Area Network) covers a small geographic area like a home, office, or campus, typically using Ethernet technology. In contrast, a WAN (Wide Area Network) spans a larger geographic area, often connecting multiple LANs. The Internet is an example of a global WAN.

4. **Explain the role of a router in a network. /3Marks**

Answer: A router is a network device that connects different networks and directs data packets between them.

5. **What is the function of a firewall in network security? /3Marks**

Answer: A firewall is a network security device or software that monitors and controls incoming and outgoing network traffic based on established security policies. It helps prevent unauthorized access and protects against cyberattacks and data breaches.

6. **Define bandwidth in networking. /3Marks**

Answer: Bandwidth refers to the maximum data transfer rate of a network connection, measured in bits per second (bps), and indicates the capacity of the network.

7. **Differentiate between Client-Server Network and Peer-to-Peer Network. /5Marks**

Answer: In a Client-Server Network, specific servers and clients are present, with a centralized server storing data. Clients request services from servers. In contrast, a Peer-to-Peer Network doesn't differentiate between clients and servers, with each node acting as both a client and server, capable of both requesting and providing services.

8. **Differentiate between logical and physical network topologies. /5Marks**

Answer: Logical topology refers to how data moves through a network, while physical topology refers to the physical layout of wires in a network.

9. **Explain the concept and features of Star Topology. /5Marks**

Answer: In Star Topology, all computers are connected to a single hub through a cable, making the hub the central node. Every node has its own dedicated connection to the hub, which acts as a repeater for data flow.

10. **Describe Ring Topology and its characteristics. /5Marks**

Answer: Ring topology forms a ring as each computer is connected to another computer, with the last one connected to the first. Each device has exactly two neighbors.

11. **What is Hybrid Topology, and what are its characteristics? /4Marks**

Answer: Hybrid Topology combines two or more topologies, such as Ring and Star. It inherits the advantages and disadvantages of the included topologies.

12. **Define Protocols in networking. /3Marks**

Answer: Protocols are sets of rules governing communication, ensuring standardized transmission and reception of data in a network.

13. **What is the purpose of subnetting IP addresses, and what are the benefits of subnetting? /4Marks**

Answer: Subnetting involves dividing a large IP network into smaller subnetworks. The benefits of subnetting include improved network performance, reduced congestion, enhanced security, controlled network growth, and eased administration.

SECTION B

1. **Describe different network technologies.**

Answer: IEEE802.3 Ethernet is a widely used LAN technology.

IEEE802.5 token ring uses a token passing scheme on a ring topology LAN. A token circulates the network, granting the right to transmit packets to the possessing computer for a certain period.

IEEE802.8 fiber optics. Fiber optics offer greater bandwidth, reduced susceptibility to interference, lighter weight and thinner cables, and the ability to transmit data digitally, making them advantageous over traditional metal cables.

IEEE802.11 Wireless. IEEE802.11 refers to specifications for wireless LAN technology, providing an interface between wireless clients and base stations

2. Give the full of the following acronyms: **/10Marks**
   a) DHCP: **Dynamic Host Configuration Protocol**
   b) ISP: **Internet Service Provider**
   c) NAT: **Network Address Translation**
   d) PAT: **Port Address Translation**
   e) VLSM: **Variable length Subnet Mask**
   f) FLSM: **Fixed Length Subnet Mask**
   g) MAU: **Multistation Access Unit**
3. Complete the following table about IPv4 class ranges: **/10Marks**

Class	Start	End
A	**0**	**127**
B	**128**	**191**
C	**192**	**223**
D	**224**	**239**
E	**240**	**255**

4. Fiber optics exist in two types. Discuss them. **/10Marks**
   Answer: Single-mode fiber cable allows **only one mode** (or wavelength) of light to propagate through the fiber. It is capable of higher bandwidth and greater distances than multimode, and it is often used for campus backbones. This type of fiber uses **lasers** as the ***light-generating method.***
   Multimode fiber cable allows **multiple modes** of light to propagate through the fiber. It uses **light-emitting diodes (LEDs)** as a light-generating device. The maximum cable length is 2 km.
5. While making Ethernet cross-over cable, there is international color coding to follow. Give the color coding for both end of a cross-over cable. **/10Marks**
   Answer:

SECTION C: MANDATORY

1. Given the network address of **192.168.132.0** and the subnet mask of **255.255.255.0** with CIDR notation **/28**. Subnet by answering the five questions related to subnetting.

   /15Marks

ANSWER:

a) How many subnet?
   11110000=240 subnet mask.
   2^4=16 subnets
b) How many hosts/subnet?
   2^4-2=16-2=**14hosts/subnet**
c) What are valid subnet?
   Block size 256-240=16

Subnets	**0**	**16**	**32**	**48**	**64**	**80**	**96**	**112**	**128**	**144**	**160**	**176**	**192**	**208**	**224**	**240**
1st Valid Host	**1**	**17**	**33**	**49**	**65**	**81**	**97**	**113**	**129**	**145**	**161**	**177**	**193**	**209**	**225**	**241**
Last Valid Host	**14**	**30**	**46**	**62**	**78**	**94**	**110**	**126**	**142**	**158**	**174**	**190**	**206**	**222**	**238**	**254**
Broadcast address	**15**	**31**	**47**	**63**	**79**	**95**	**111**	**127**	**143**	**159**	**175**	**191**	**207**	**223**	**239**	**255**