UGANDA MARTYRS UNIVERSITY

UNIVERSITY EXAMINATIONS

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION SYSTEMS

END OF SEMESTER FINAL ASSESSMENT

SEMESTER I, 2023/24

SECOND YEAR EXAMINATION FOR BACHELOR OF INFORMATION TECHNOLOGY, COMPUTER SCIENCE AND SCIENCE GENERAL

Data Communications and Networks

CSC2104

DATE: 12TH DECEMBER 2023

TIME: 02:00 PM – 05:00 PM

DURATION: 03.00 HRS

Instructions:

1. *Carefully read through **ALL** the questions before attempting*
2. *Examination has **TWO** Sections **A** and **B***
3. *Section **A** is Compulsory*
4. *Attempt **ANY THREE** Questions in Section **B**.*
5. *In Section **B**, avoid one-word answers. Explain your answers in an understandable manner*
6. *Ensure that your **Reg number** and **Student Number** are indicated on the examination answer booklet.*
7. *Leave a space or line before answering the next number.*
8. *Do not open the answer booklet unless directed by the Invigilator.*
9. *Any type of examination Malpractice will lead to penalties*
10. *All University Rules Apply.*

Section A: Compulsory (25 marks)

1. Which of the following is a common network protocol used for sending and receiving email?
   A. SMTP B. FTP
   C. ICMP D. HTTP

2. In a bus topology, how are devices connected to the main cable?
   A. In a daisy-chain manner B. In a circular manner
   C. In a linear manner D. In a Point-to-Point manner

3. What does IP stand for in the context of networking?
   A. Internet Protocol B. Internet Provider
   C. Intranet Protocol D. Interconnect Protocol

4. What is the purpose of a router in a computer network?
   A. To filter and control network traffic B. To detect faults in a network
   C. To create routes for data between networks D. To improve network performance

5. Which is the primary role of a repeater in a computer network?
   A. to connect different types of networks B. to switch data between devices
   C. to segment a network into collision domains D. to amplify and regenerate signlas

6. What is the primary function of the Transport Layer in the OSI layered model?
   A. Physical medium management B. Data encapsulation
   C. Data manipulation D. End-to-end communication

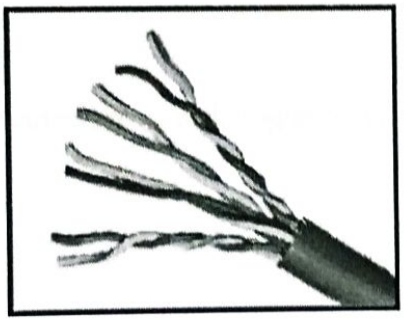
7. Which of these is the main purpose of a MAC (Media Access Control) address?
   A. to identify the computer's IP address B. to identify data on the network
   C. to identify the computer's hardware interface D. to encrypt data transmissions

8. What is information is contained in an IP header?
   A. source and destination IP addresses
   B. source and destination MAC addresses
   C. only destination IP and MAC addresses
   D. both source and destination IP and MAC addresses

9. Why is security a very important issue in wireless networks?
   A. wireless networks are typically slower than wired networks
   B. radio signals from other devices in the network can interfere with wireless networks
   C. wireless devices broadcast data over a medium that allows easy access
   D. environmental factors such as thunderstorms can affect wireless networks.

10. Which statement describes the logical token-passing topology?
   A. usage of the network channel is on a first come, first serve basis
   B. computers are allowed to transmit data only when they possess a token
   C. data from a host is received by all other hosts
   D. token-passing networks have problems with high collision rates
11. Multiplexing is .....
   A. the process of increasing bandwidth of a channel
   B. a technique that enables more than one data source to share the use of a common line
   C. the capacity to share frequency by time
   D. the phenomenon where multiple channels are availed data.

12. What type of cabling is shown in the picture below?
   A. STP cable
   B. UTP cable
   C. Coaxial cable
   D. Fiber optic cable



13. Which wireless communication technology is commonly used for short-range data exchange between devices like smart phones and smartwatches?
   A. Cellular short-range
   B. Bluetooth
   C. Infrared
   D. Wi-Fi

14. Which of the following is a characteristic of coaxial cables?
A. high susceptibility to electromagnetic interference
B. used for short distance communication
C. low data transfer rates
D. suitable for both analog and digital signals
15. Which of the following conditions required cables not to exceed a recommended maximum length?
A. modulation
B. attenuation
C. bandwidth
D. distortion
16. Which of the following is a characteristic of fiber-optic cabling?
A. can be used in electrically noisy environments
B. requires only a single strand of fiber for network connections
C. carries data over longer distances that UTP and coaxial cables
D. has low bandwidth
17. The interactive transmission of data within a time sharing system may be best suited to.....
A. simplex line
B. half duplex line
C. full duplex line
D. bi-flex line
18. In a synchronous modem, the digital-to-analog converter sends a signal to the .....
A. transmission line
B. modulator
C. terminal
D. equalizer
20. In the OSI network architecture, the dialogue control, and token passing management are responsibilities of .....
A. data link layer
B. network layer
C. transport layer
D. session layer
21. Transmission of binary signals requires.....
A. less bandwidth than analog
B. more bandwidth than analog
C. same bandwidth as analog
D. a licence from the countries communication regulator
22. In data communication, modulation is .....
A. transmission of pulses in direct current form over a copper wire or cable
B. utilization of a single transmission channel to carrying multiple signals

C. varying of some parameter of a carrier, such as its amplitude to transmit data
D. none of these

23. .....are the waves used in cellular phones, satellite and all other wireless networks
A. Infrared
B. Microwaves
C. Radio waves
D. Signal waves

24. A half-duplex communication channel permits information travel .....
A. both ways at once
B. one direction only
C. at timed intervals
D. both ways, but not at once

25. The 32-bit internet address 10000000 000010100 0000010 00011110 will be written in dotted decimal notation as.....
A. 148.20.2.30
B. 164.100.9.61
C. 210.20.2.64
D. 128.10.2.30

Section B: Attempt **ANY THREE** questions (75 marks)

Question One

Explain the following concepts with respect to data communications and networks. For each concept, outline how it impacts either negatively or positively to the data communication process.

(i) Noise
(ii) Signal Attenuation
(iii) Bandwidth
(iv) Throughput
(v) Latency (25 marks)

Question Two

(a) How are OSI and ISO related to each other? (2 marks)

(b) Discuss the role of each layer in the OSI layered model. In your discussion, elaborate on the major functions performed by each layer. For each layer, identify at least two protocols.

(21 marks)

(c. Explain any two differences between the OSI model and the TCP/IP layered model
(2 marks)

Question Three

(a) Outline and explain FIVE reasons why we need computer networks in today's World. Give examples in your discussion. (5 marks)

(b) Hill Road Public School is setting up its office network and has specific requirements for different areas. Analyze each scenario and recommend the most suitable network device for each case. For each case, provide a brief explanation of why the chosen network device is appropriate for the given scenario. (3 marks for each scenario)

(i) Interconnecting Two Offices: The school has two offices in different locations, and they need a device to connect them and facilitate communication between them. What network device would you recommend for this scenario?

(ii) Reducing collision domain in a Department: In one of the larger departments, network collisions are causing performance issues. Identify the network device that can be deployed to reduce collisions of packets and improve network efficiency.

(iii) Extending Wireless Coverage in a Large Open Workspace: The school has large open spaces where students and employees need seamless wireless connectivity. What network device would you deploy to ensure reliable and easy connectivity throughout this area?

(iv) Securing Communication between Sensitive Departments: Certain departments like administration and Finance deal with sensitive information, and the school wants to ensure secure communication within these departments. Recommend a network device that can enhance the security of communication between these departments:

(v). Connecting Multiple Devices in a Small Meeting Room: The school staff frequently hold small meetings in a dedicated room, and they need a device to connect multiple devices for collaborative work during these meetings. What network device is suitable for connecting devices in a small meeting room?

(vi). Improving Signal Strength in a Remote Corner of the Office: In a remote corner of the Headmaster's office, the wireless signal strength is weak. Identify the network device that can be used to improve the signal strength in this specific location.

Question Four

(a) With examples, explain the following terms as used in addressing in computer networks.

(i) Physical address
(ii) Logical address
(iii) Port address
(iv) Specific address

(12 marks)

(b) Differentiate the terms Analog transmission and Digital transmission. Draw diagrams where possible to help explain your points. (4 marks)

(c) (i) Outline **five** advantages of Digital transmission. (5 marks)

(ii) Outline any **two** disadvantages of digital transmission. (2 marks)

(ii) Outline any **two** advantages of analog transmission (2 marks)

Question Five

(a) Explain how the Fiber Optic cable successfully transmits data from the source node to the destination node. (10 marks)

(b) Discuss the types of Fiber Optic cables and how each transmits data. Highlight where each type is regularly used in the communication industry. (8 marks)

(c). (i) Discuss any **Four** reasons you would choose Fiber Optic cable over other transmission media? (4 marks)

(ii) Discuss any **Three** disadvantages you think Fiber Optic cable has over other transmission media. (3 marks)

Question Six

(a) Highlight the types of Wireless transmission media. For each type of transmission media, explain its characteristics, how and where it is utilized in the data communication field. (7 marks)

(b) Discuss the types of Wireless Networks that are mainly applied in data communication. For each type of network, explain its characteristics and where it is mainly applied or employed. (12 marks)

(c) Ocheng is a network engineer that is designing a computer network for a university campus. He has chosen you as his partner to advise him on how to set up a wireless network. How would you advise him on where and how to install.

(i) Omni directional antennas

(ii) Directional antennas

(iii) MIMO antennas (6 marks)

END