UGANDA MARTYRS UNIVERSITY

UNIVERSITY EXAMINATIONS

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION SYSTEMS

END OF SEMESTER FINAL ASSESSMENT

SEMESTER I, 2021/22

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

Data Communications and Networks

CSC2104

DATE:	28TH JANUARY 2022
TIME:	09:30 AM – 12:30 PM
DURATION:	03.00 HRS

Instructions:

1. *Carefully read through ALL the questions before attempting*
2. *No **names** should be written anywhere on the examination book.*
3. *Ensure that your **Reg number** is indicated on all pages of the examination answer booklet.*
4. *Leave a space or line before answering the next number.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*
7. *Do not write anything on the questions paper.*

(Attempt any **Five** Questions)

Question One

(a) Explain why the OSI reference model is necessary in Data Communications and Networks. (2 marks)

(b) Starting with the lowest layer, list down the layers of the OSI model. Explain the roles or functions of each of the layers you have listed. For each layer, mention at least two protocols that operate there. (14 marks)

(c) The OSI model was not readily taken up as a usable communication model. This was due to some challenges. Explain at least **four** challenges that the OSI model has faced. (4 marks)

Question Two

(a) Identify and discuss the components of the Data Communications System. (5 marks)

(b) A Communications network is characterized by interconnected nodes that necessitate sharing of network resources. Briefly explain how the combinations below operate to form a communications network;

(i) Cell Phone networks. (3 marks)

(ii) A laptop and a wireless connection (3 marks)

(b) Discuss any three reasons why we can't do without a computer network in today's operations. (5 marks)

(c) With examples, explain the difference between half-duplex and full-duplex modes of transmission. (4 marks)

Question Three

(a) With examples, explain the following terms as used in Data communications and Networks

(i) Physical address

(ii) Logical address

(iii) Port address

(iv) Specific address (8 marks)

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

(c) (i) Outline **four** advantages of Digital transmission. (4 marks)

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

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

Question Four

(a) With examples, discuss the differences between guided media and unguided media. In your discussion, explain why you would use one type of media over the other. (5 marks)

(b) With examples and/or diagrams where necessary explain the following terms as used in Data transmission.

i. Network media
ii. Near-End crosstalk
iii. Thermal noise
iv. Amplitude and frequency
v. Multiplexing (15 marks)

Question Five

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

(i) Signal Distortion
(ii) Signal attenuation
(iii) Bandwidth
(v) Latency (20 marks)

Question Six

(a) Explain the term Channel Capacity as applied in data transmission. (3 marks)

(b) A Fiber Optic cable has got a 10 MHz channel operating in an SNR of 15 dB. Use Shannon's theorem to calculate the possible Channel Capacity of that Fiber Optic Channel. (8 marks)

(c) After making consultations with a network consultant our company established that the transmission media we had purchased had a Channel Capacity of 66 Mbps and an SNR of 20 dB. Calculate the Bandwidth of the channel. (9 marks)

Question Seven

The QUIC, TCP and UDP protocols have been instrumental in necessitating smooth data transfer within computer networks. Discuss each of these protocols in detail. In your discussion, outline the characteristics, mode of operation, strengths, weaknesses and where each is mainly employed in the data communication process. (20 marks)

END