



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION
ENGINEERING)

SPH 406: INFORMATION TECHNOLOGY II

DATE: 18/8/2021

TIME: 11:00 – 1:00 PM

INSTRUCTIONS:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 3 printed pages

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) State two differences in terms of operation between the following:
 - i. The network layer and the transport layer
 - ii. The data link layer and the network layer (4 marks)
- b) Explain why CSMA/CD cannot work in a wireless network. (3 marks)
- c) Explain the operation of selective repeat protocol (3 marks)
- d) Explain the importance of the media access control sub layer of the data link layer (3 marks)
- e) State and briefly explain three static channel allocation methods (3 marks)
- f) State three sources of congestion at the network layer. (3 marks)
- g) Describe the difference between integrated services and differentiated services methods of QoS control. (4 marks)

- h) Explain why flow control and error control is needed both at the transport layer and the data link layer. (4 marks)
- i) Briefly describe the slow start algorithm of TCP (3 marks)

QUESTION TWO (20 MARKS)

- a) Define the following data link layer terms:
 - i. Automatic repeat request (ARQ)
 - ii. Piggybacking
 - iii. Pipelining
 - iv. Sliding window protocol(4 marks)
- b) State and explain three types of services that the data link layer can provide to the network layer. (6 marks)
- c) Describe how the data link layer can implement the following:
 - i. Flow control
 - ii. Error control(4 marks)
- d) Explain why modern networks that make use of switches rather than hubs no longer need CSMA (3 marks)
- e) Describe the difference between go-back N protocol and selective repeat protocol. (3 marks)

QUESTION THREE (20 MARKS)

- a) State two design goals of the network layer services. (2 marks)
- b) State and explain three types of services that the data link layer can provide to the network layer. (6 marks)
- c) Explain three differences between a virtual circuit network and datagram network. (3 marks)
- d) Describe the difference between leaky bucket and token bucket. (5 marks)
- e) Explain the operation of the following congestion control methods:
 - i. Traffic aware routing
 - ii. Traffic throttling(4 marks)

QUESTION FOUR (20 MARKS)

- a) Explain why CSMA/CD cannot be used for wireless networks such as WiFi. (3 marks)
- b) State three classes (types) of media access control. (3 marks)
- c) Distinguish between p-persistent CSMA and 1-persistent CSMA. (4 marks)
- d) Explain how limited contention protocols address some of the weaknesses of contention free protocols and contention-based protocols. (4 marks)
- e) Describe the operation of the following:
 - i. Wavelength Division Multiple Access (WDMA)
 - ii. Binary countdown protocol(6 marks)

QUESTION FIVE (20 MARKS)

- a) State four well known TCP ports. (2 marks)
- b) With respect to TCP, define the following terms:
- i. Congestion window
 - ii. AIMD (Additive Increase Multiplicative Decrease)
 - iii. Multiplexing
 - iv. Exponential weighted moving average
- (4 marks)
- c) With the use of diagrams, describe the operation of the following:
- i. TCP Connection Establishment
 - ii. TCP Connection Release
- (6 marks)
- d) Briefly explain how TCP is able to jointly achieve both flow control and error control. (5 marks)
- e) Explain why RTP is suitable for multimedia communications. (3 marks)