



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

EEE 4318 DATA COMMUNICATION AND COMPUTER NETWORKS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

DATE: April 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions; Question ONE is compulsory. In addition attempt any Other TWO Questions.

Do not write on the question paper.

Question ONE

- a) Outline the principles used in defining OSI layer. **(5 marks)**
- b) Describe the **SEVEN** layers of OSI model. **(10 marks)**
- c) Explain the occurrence of the **FOUR** main data transmission impairments. **(8 marks)**
- d Derive the expression for:
 - i) Free space power loss for line of sight transmission.
 - ii) Determine the isotropic free space loss at 4GHz for the shortest path to a synchronous satellite from earths (35 863 km). **(7 marks)**

Question TWO

- a) Using appropriate diagram, explain the principles of optical transmission. **(4 marks)**
- b) Distinguish between:

- i) Step-index multi-mode fibre.
- ii) Graded indexes multimode fibre.
- iii) Single mode optical fibre.

(6 marks)

c) Wireless mode:

- i) Ground wave
- ii) Skywave
- iii) Line of sight

(6 marks)

D) For a parabolic reflective antenna with a diameter of 2 metres operating at 12GHz, determine the effective area and antenna gain.

(4 marks)

Question THREE

a) Distinguish between packet and circuit switching.

(10 marks)

b) Explain the operation of a **THREE** stage space Division Switch.

(4 marks)

C Derive the expression for:

i) Free space power loss for light of sight transmission.

ii) Determine the isotropic free space loss at 4GHz for the shortest path to a synchronous satellite from earths (35763km).

(6 marks)

Question FOUR

a) Distinguish between:

- i) Frequency hopped and direct sequence spread spectrum.
- ii) Frequency Division Multiplexing Multiple Access and Time Division Multiplexing Access.

(10 marks)

b) Distinguish between stop and wait and sliding window flow control.

(4 marks)

c) Describe:

- i) Stop and wait ARQ
- ii) Go back N ARQ
- iii) Selective reflect ARQ

(6 marks)

Question FIVE

- a) i) With an appropriate diagram describe the operation of a CRC (Cyclic Redundancy Check) encoder. (4 marks)
- i) Using a message 101 000101 and pattern $P = 110101$, illustrate how the code is generated. (6 marks)
- (b) (i) State the consideration taken in selecting a line encoding scheme.
- (ii) Draw line encoding waveform for the following schemes for the data 10110001101
- (I) NRZ-L
 - (II) RZ unipolar
 - (III) Bipolar RZ
 - (IV) Biphas M
 - (V) Delay modulation
- (10 marks)

Question SIX

- a) Develop a AFS encryption and decryption a logarithm. And illustrate with an approximate example. (6 marks)
- b) Develop KSA Public-key encryptions Algorithms and illustrate with an appropriate example. (6 marks)
- c) Derive the expression for through part for:
- ii) Token passing
 - iii) Carrier sense multiple access with collision detection and illustrate their performance using an appropriate graph. (8marks)