



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING DEGREE

EEE 4318 DATA COMMUNICATION AND COMPUTER NETWORKS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2 HOURS

DATE: July 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; attempt any **THREE** 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 light 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)
 - (i) Draw a circuit to divide polynomials in cyclic error coding.
 - (ii) Using the circuit in (i) illustrate division of :

$$V(x) = X^3 + X^5 + X^6 \text{ by } g(x) = 1 + X + X^3$$
(7 marks)
- (b) . Using appropriate diagram, explain the principles of optical transmission. **(4 marks)**

C) Distinguish between:

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

(6 marks)

Question THREE

- a) Distinguish between packet and circuit switching.
- b) Explain the operation of a **THREE** stage space Division Switch.
- C) Derive the expression for:

(10 marks)

(4 marks)

- 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) State the requirements and objectives for effective data transmission

(6marks)

- b) Briefly describe the stop and wait flow control method (6 marks)

- c) A 200m optical fiber operating at 1Gps, if the velocity of propagation in optical fibre is 2×10^8 m/s. For a frame of 1000 octets, calculate

- i) Time to transmit the frame

- ii) Time to transmit in a 1Mbps satellite link for a geostationary satellite at 36,000km.

(8 marks)

Question FIVE

- a) Describe with the aid a diagram the sliding window flow control method.(11 marks)
- b) State and demonstrate the three automatic repeat request error control methods

(9 marks)

QUESTION SIX

- 3a(i) State shanon-Hartley theorem

(ii) State the objectives of error control coding

(iii) Define the following I code rate II Distance. (6Marks)

- b. The BER of a scheme is 10^{-6} four bits are used in transmission

Calculate:

- i. The probability of 2 bits being in error
- ii. The probability of three bits being in error if a (7,4) error coding scheme is used
- iii. Determine the no of errors that can be I detected II corrected in b(i) and b(ii). (8Marks)