EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

ELECTRICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

EP 501: FIBER OPTIC COMMUNICATION SYSTEM

DATE: 23rd NOVEMBER 2012 (FRIDAY)
DURATION: 2 HOURS (8.30AM – 10.30AM)

This paper consists of SEVEN (7) pages including the front page.
Section A: Structure (10 questions – answer all)
Section B: Essay (3 questions – answer all)

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THE CHIEF INVIGILATOR

(The CLO stated is for reference only)
SECTION A

STRUCTURE (40 marks)

INSTRUCTION:

This section consists of TEN (10) structured questions.
Answer ALL questions.

QUESTION 1

Explain the function of transmitter and receiver in fiber optic communication system [CLO1:C2]

(4 marks)

QUESTION 2

State FOUR (4) fiber optic technology applications [CLO1:C1]

(4 marks)

QUESTION 3

Briefly explain about refraction. [CLO1: C2]

(4 marks)

QUESTION 4

Sketch a Total Internal Reflection (TIR) in light propagation. [CLO1: C3]

(4 marks)

QUESTION 5

State FOUR (4) types of connector in fiber optic system. [ CLO1 : C1 ]

(4 marks)

QUESTION 6

Explain the Material Scattering Losses. [CLO1:C2]

(4 marks)
QUESTION 7

![Diagram of a typical cable plant with connectors and splices in the middle.](image)

**Figure Q7(a)**

*Figure Q7 (a) above shows a typical cable plant with 6 km single mode link with 5 connectors and 2 splices in the middle. Operating wavelength is 1300nm with fiber attenuation is 0.4dB/km, connector loss is 0.30 dB and splice loss is 0.35dB. Calculate the total fiber loss at the operating wavelength, connector loss, splice loss and total cable plant loss. [CLO1:C3]*

(4 marks)

QUESTION 8

Give **TWO** (2) factors to be considered in link power budget. [ CLO 1 : C2 ]

(4 marks)

QUESTION 9

Explain optical power.[CLO1 : C2]

( 4 marks )
QUESTION 10

(a) Name TWO (2) standards organisations involved in formulating testing standard in fiber optic measurement. [CLO1 : C1]

(b) State TWO (2) functions for the standards organisations in 2(a) above. [CLO1 : C1]
SECTION B

ESSAY (60 marks)

Instruction: This section consists of THREE (3) essay questions. Answer all questions.

QUESTION 1

(a) Define the terms below:

i. Acceptable angle
ii. Numerical Aperture (NA)
iii. Critical Angle

(b) State light propagation in Fiber Optic based on Snell’s Law.

(c) With the aid of a diagram, describe the construction of the fiber optic cable.

(d) List TWO (2) differences between single mode step index fiber and multimode graded index fiber.
QUESTION 2

Figure Q2 is a block diagram of an optical networking system.

(a)  

Figure Q2 is a block diagram of an optical networking system.

i) Name this system.  
\[ \text{CLO1: C1} \]  
(1 mark)

ii) Refer to Figure 2, label block A, B, C and D.  
\[ \text{CLO1: C1} \]  
(4 marks)

iii) Explain briefly the function of Block A, B, C and D.  
\[ \text{CLO1: C2} \]  
(8 marks)

iv) State TWO (2) advantages and TWO (2) disadvantages of this system.  
\[ \text{CLO1: C1} \]  
(4 marks)

(b) State the function of add/drop multiplexer/demultiplexer in an optical network system.  
\[ \text{CLO1: C1} \]  
(3 marks)
QUESTION 3

(a) Define insertion losses. [CLO1 : C1] (2 marks)

(b) Define basic classes of standard in fiber optic measurement and test:
   i. Primary Standards (3 marks)
   ii. Component and testing standards (3 marks)
   iii. System standards (3 marks)

(c) Describe the following fiber optic test: [CLO1 : C1]
   i. Continuity testing (3 marks)
   ii. Insertion loss testing (3 marks)
   iii. Optical time domain reflectometer (OTDR) testing (3 marks)