



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PHYSICS
2025_1 EXAMINATION

COURSE CODE: PHY406
COURSE TITLE: OPTICS III
CREDIT UNIT: 3
TIME ALLOWED: (3 HRS)
INSTRUCTION: *Answer question 1 and any other three questions*

QUESTION 1

- ai. Highlight the condition for sources that emit wave to be said to be coherent [4 marks]
- ii. What will happen when two coherent light waves superpose having the same amplitude, frequency and phase? [6 marks]
- bi. What does the word laser stand for? [2 marks]
- ii. Define holography and discuss hologram [5 marks]
- ci. Discuss the concept of Total Internal Reflection. [5 marks]
- ii. Explain the transmission of through an optic fibre based on the principle of total internal reflection. [3 marks]

(Total: 25 marks)

QUESTION 2

- a. Show that the frequency spread of a spectra line is of the order of the inverse of the coherence time [7 marks]
- b. Briefly discuss temporal coherence and highlight the requirements of temporal coherence [8 marks]

(Total: 15 marks)

QUESTION 3

- a. Discuss spontaneous emission, absorption, and stimulated emission of light, illustrate with a figure. [12 marks]
- b. Identify the scientist that postulated the theories listed above (Question 3a) [3 marks]

(Total: 15 marks)

QUESTION 4

- a. Explain the basic concept involved in holography with the use of a figure [11 marks]
- b. What is the essence of holography? [4 marks]

(Total: 15 marks)

QUESTION 5

- ai. Explain pulse dispersion in fibre [4 marks]
- ii. Discuss the concept of material broadening. [5 marks]
- b. Highlight three (3) mechanism of energy loss [6 marks]

(Total: 15 marks)

QUESTION 6

- ai. In the case of a laser, what is an active media and feedback? [4 marks]
- ii. Highlight general requirement for an active medium [3 marks]
- iii. State the prerequisite for a laser to operate? [3 marks]
- b. Explain the ways holograms can be produced. [5 marks]

(Total: 15 marks)