

DEPARTMENT OF PHYSICS

2024 1 EXAMINATION

COURSE CODE: PHY 406
COURSE TITLE: OPTICS III
CREDIT UNIT: 3
TIME ALLOWED: (3 HRS)

INSTRUCTION: *Answer question 1 and any other three questions*

QUESTION 1

- ai. Briefly discuss transverse spatial coherence [4 marks]
- ii. What is the relationship between temporal coherence and length of wave train? [4 marks]
- bi. When does light emission take place in an atom? And write the expression of the frequency of the emitted radiation. [5 marks]
- ii. What are necessary attribute that must be recorded to obtain the hologram? [4 marks]
- ci. Describe, in its simplest form, an optic fibre, and also explain step-index fibre. [4 marks]
- ii. Illustrate the variation of the refractive index with the radius of a step-index fibre. [4 marks]

(Total = 25 marks)

QUESTION 2

- a. If light of 660 nm wavelength has a wavetrain $\lambda/20$ long, what is its (i) coherence length and (ii) coherence time. [10 marks]
- b. Discuss Monochromaticity [5 marks]

(Total = 15 marks)

QUESTION 3

- a. Describe the mechanism that will ensure the spatial coherence of the laser beam. Use of diagram necessary. [10 marks]

- 4a. What are the key elements evaluated by NPV in assessing an asset or investment? 5marks
- 4b. What challenges are associated with income flows and discount rate in NPV analysis? 5marks
- 4c. How does the Appraised Value Method work in valuing exploration properties? 3marks
- 4d. What are the limitations and advantages of the Appraised Value Method? 5marks
- 5a. How is resource rent estimated in the Appropriation Method? 5marks
- 5b. What is the Cost Approach used for in resource evaluation? 5marks
- 5c. How does the Income Approach account for changes in resource extraction rates and lifetime? 4marks
- 5d. What are the advantages of the Market Price Method in resource evaluation? 6marks

Question Four

- 4a. Describe the structure of E-R model with relevant example **10marks**
- 4b. With the aid of a diagram, explain four (4) possible connectivity relationships between entities. **10marks**

Question Five

- 5a. State the base prerequisite condition for a reductant database to be converted into First Normal Form, Second Normal Form and Third Normal form respectively **10marks**
- 5b. Explain any five (5) types of attributes used in ER diagrams **10marks**