



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PHYSICS

2025_2 EXAMINATIONS

COURSE CODE: PHY 457
COURSE TITLE: ENVIRONMENTAL PHYSICS
CREDIT UNIT: 3
TIME ALLOWED: 3 HRS

INSTRUCTION: Answer question 1 and any other three questions

QUESTION 1

- A What is the name software used to analyze remote sensing data
- B Discuss the following energy resources
- i Air pollution
 - ii Thermal Pollution
 - iii Fossil Fuel steam plant
- C All synchronous satellites are put into orbit whose radius $r = 4.23 \times 10^7 \text{m}$ the orbit is in the plane of the equator. The arc length s that separate two adjacent synchronous satellites is $7.4 \times 10^5 \text{m}$. Find the angular separation of the satellites in degrees.
- D Explain the concepts of processing of remote sensing data

QUESTION 2

- A Discuss the following briefly as related with global weather and climatic patterns
- i weather and landform
 - ii human activity and the environment
 - iii greenhouse effect
- B.) Enumerate 3 environmental problems facing mankind

QUESTION 3

Batteries make up a significant part of the in-orbit weight of a communications satellite but are needed to keep the communications system operating during eclipses. A direct broadcast TV satellite requires 500 W of electrical power to operate the housekeeping functions of the satellite and 5 kW to operate its 16 high power transponders. The longest duration of an eclipse is 70 minutes, during which time the batteries must provide power to keep the satellite operating, but the batteries must not discharge below 70% of their capacity. The satellite bus operates at 48 volts

- A. What is the current that must be supplied by the power conditioning unit to keep the satellite operating normally?
- B. Battery capacity is rated in ampere hours, the product of the current (in amps) that the battery can supply multiplied by the length of time that this current can be supplied before the battery is fully discharged. The satellite batteries must not discharge beyond 70% of their rated capacity during eclipse. Find the battery capacity required for this DBS-TV satellite.

C. If batteries weigh 1.25 kg per ampere-hour of capacity, how much weight on this satellite is devoted to batteries?

D. If half of the transponders are shut down during eclipse, what saving in battery weight is achieved?

QUESTION 4

Discuss the following energy resources

A. Hydroelectric Power Plant

B. Wind Power Plants

C. Solar Energy

QUESTION 5

A. Briefly discuss Geothermal Energy

B. Discuss any four advantages and two disadvantages of geothermal energy

QUESTION 6

A. What is meant by satellite communication?

B. Explain the term orbital speed with relevant derivation

C. List four types of communication satellite