**GE3451-ENVIRONMENTAL SCIENCE AND SUSTAINABILITY**

**PART-A**

**UNIT1**

1. **Define Eco-System with an example?**

An **ecosystem** is a community of living organisms interacting with each other and their physical environment (air, water, soil). These interactions allow the flow of energy and nutrients within the system.

**Example:** A **forest ecosystem** consists of trees, plants, animals, and microorganisms interacting with soil, water, and air.

1. **Give any to examples of physical hazard?**

**Extreme Heat:** Prolonged exposure to high temperatures can cause heatstroke or dehydration.

**Slippery Surfaces:** Wet or icy surfaces can lead to slips, falls, and injuries.

1. **What are hotspots of biodiversity?**

Hotspots of biodiversity are regions that are both rich in species and have a high level of endemism (species found nowhere else), but are also under significant threat from human activities, such as deforestation, pollution, and climate change. These areas are crucial for conservation efforts because they contain a large number of unique species that are at risk of extinction.

Hotspots are typically identified based on two criteria:

* **Endemic species**: Species found only in that region.
* **Threat level**: Areas that have lost at least 70% of their original habitat.

1. **Discuss the water cycle.**

The **water cycle** is the continuous movement of water within the Earth and atmosphere, involving various processes:

* Evaporation
* Transpiration
* Condensation
* Precipitation
* Infiltration
* Runoff
* Collection

1. **What are biodiversity and its significance?**

Biodiversity refers to the variety and variability of life on Earth, including the diversity of species, ecosystems, and genetic variation within species.

 **Ecosystem Services**: Biodiversity supports essential ecosystem functions such as pollination, water purification, soil fertility, and climate regulation.

 **Human Benefits**: It provides resources like food, medicine, and raw materials, and contributes to cultural, recreational, and economic activities.

1. **What is threatened species?**

A threatened species is a species that is at risk of becoming endangered or extinct in the near future**.**

Threatened species are categorized into three main levels of risk:

* Vulnerable (VU): Species that are likely to become endangered if the threats continue.
* Endangered (EN): Species that are facing a very high risk of extinction in the wild.
* Critically Endangered (CR): Species that are on the verge of extinction and face an extremely high risk.

1. **Define environment. Mention its components.**

The environment refers to the surroundings or conditions in which living organisms exist, including both natural and human-made elements. It includes everything that influences an organism, such as air, water, land, plants, animals, and other living and non-living things.

**Components of Environment:**

* **Biotic Components**: The living organisms in the environment, including plants, animals, and microorganisms.
* **Abiotic Components**: The non-living physical and chemical factors, such as air, water, sunlight, temperature, and soil.

1. **Define environmental science & environmental education.**

**Environmental Science:**

Environmental science is the interdisciplinary field that studies the interactions between the physical, chemical, and biological components of the environment. It focuses on understanding environmental problems and finding solutions to protect the environment and human health.

**Environmental Education:**

Environmental education is the process of teaching individuals and communities about the environment, its importance, and how to protect and conserve natural resources. It aims to raise awareness and promote responsible behavior towards the environment.

1. **Define consumers, producers and decomposers**

**Producers:** Organisms, primarily plants and algae, that produce their own food through photosynthesis. They form the base of the food chain and provide energy for consumers.

**Consumers:** Organisms that cannot produce their own food and rely on other organisms (producers or other consumers) for nutrition. Examples include herbivores, carnivores, and omnivores.

**Decomposers:** Organisms such as fungi, bacteria, and some insects that break down dead plants and animals, recycling nutrients back into the ecosystem**.**

**UNIT II ENVIRONMENTAL POLLUTION**

**PART-A**

1. **Define Pollution.**

Pollution refers to the introduction of harmful substances or contaminants into the environment, leading to adverse effects on air, water, land, and living organisms. It can result from human activities or natural processes.

1. **What is PAN? Give its detrimental effect.**

**PAN (Peroxyacetyl Nitrate):**

PAN is a type of secondary air pollutant formed by the reaction of hydrocarbons and nitrogen oxides in the presence of sunlight. It is a component of photochemical smog.

**Detrimental Effects of PAN:**

**Respiratory Problems:** PAN can cause irritation to the eyes, nose, and throat, leading to breathing difficulties.

**Damage to Vegetation**: It can damage plant tissues, reduce photosynthesis, and stunt growth.

**Health Hazards:** Long-term exposure may result in more severe health problems like lung damage and weakened immune systems.

1. **Define photochemical smog.**

**PhotochemicalSmog**:  
Photochemical smog is a type of air pollution that forms when sunlight reacts with pollutants such as nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the atmosphere. This reaction produces harmful secondary pollutants like ozone (O₃) and peroxyacetyl nitrates (PANs), leading to smog formation, particularly in urban areas.

1. **What are types of acid rain?**

**Types of Acid Rain:**

**Wet Acid Deposition:** This occurs when pollutants like sulfur dioxide (SO₂) and nitrogen oxides (NOx) react with water vapor in the atmosphere, forming sulfuric acid (H₂SO₄) and nitric acid (HNO₃), which then fall as acid rain, snow, fog, or mist.

**Dry Acid Deposition:** This occurs when acidic particles and gases (like SO₂ and NOx) are deposited directly onto surfaces, such as soil, water, and vegetation, without the involvement of water. These pollutants can be inhaled and contribute to the acidification of ecosystems.

1. **Define BOD and COD.**

**BOD (Biochemical Oxygen Demand):**

BOD is the amount of dissolved oxygen required by microorganisms to break down organic matter in water over a specific period, typically 5 days at 20°C. It indicates the level of organic pollution in water.

**COD (Chemical Oxygen Demand):**

COD is the amount of oxygen required to chemically oxidize organic and inorganic substances in water using a strong oxidizing agent. It measures the overall water pollution, including both biodegradable and non-biodegradable substances.

1. **Define thermal pollution.**

**Thermal Pollution:**

Thermal pollution refers to the degradation of water quality caused by an increase in water temperature, typically due to human activities such as industrial processes, power plants, or deforestation. Elevated temperatures can harm aquatic ecosystems, reduce oxygen levels, and disrupt the reproduction and growth of aquatic organisms.

1. **Define marine pollution.**

**Marine Pollution:**

Marine pollution is the contamination of ocean waters by harmful substances, such as plastics, oil, chemicals, and sewage, which negatively affect marine life and ecosystems.

1. **Define noise pollution**

Noise Pollution:

Noise pollution is the harmful or disturbing effect of excessive noise on human health and the environment, caused by sources like traffic, industries, and loud music.

1. **Mention the effects of nuclear pollution**

**Effects of Nuclear Pollution:**

Health Issues: Exposure to radiation can lead to cancer, genetic mutations, and other health problems.

Environmental Damage: It can harm ecosystems, soil, and water, affecting plants and animals.

Long-term Impact: Nuclear pollution can persist for long periods, affecting future generations.

1. **Mention the methods of disposal of radioactive wastages**

**Methods of Disposal of Radioactive Wastes:**

Deep Geological Disposal: Storing radioactive waste deep underground in stable rock formations.

Ocean Disposal: Disposing of low-level radioactive waste into the deep ocean (now restricted in many countries).

Above-ground Storage: Storing waste in secure containers at specialized facilities.

Reprocessing: Reusing spent nuclear fuel by extracting usable materials.

**UNIT III RENEWABLE SOURCES OF ENERGY**

**PART-A**

1. **What are the types of natural resources?**

**Types of Natural Resources:**

Renewable Resources: Resources that can be replenished naturally, e.g., solar energy, wind, water.

Non-Renewable Resources: Resources that are finite and cannot be replenished, e.g., coal, oil, minerals.

1. **Define deforestation and causes of deforestation.**

**Deforestation and Causes:**

**Deforestation:** The clearing or removal of forests for land use.

**Causes:** Agricultural expansion, logging, urbanization, mining, fires, and infrastructure development.

1. **Define mining and its types.**

**Mining and Its Types:**

* Mining: The process of extracting valuable minerals or other geological materials from the Earth.

**Types of Mining:**

* Surface Mining: Involves removing the earth’s surface to access mineral deposits, e.g., open-pit mining, strip mining.
* Underground Mining: Involves digging tunnels or shafts to reach minerals beneath the Earth's surface, e.g., shaft mining, drift mining.

1. **What are the steps involved in mining**

**Steps Involved in Mining:**

Exploration: Identifying and assessing mineral deposits.

Extraction: Removing the mineral from the earth.

Processing: Separating the valuable material from the waste.

Rehabilitation: Restoring the environment after mining activities.

Transport: Moving the extracted material to processing plants or markets.

1. **Define OTE.**

**OTE (Operational Taxonomic Unit):**

OTE refers to a unit of classification used in microbial ecology to categorize and identify species or groups of organisms, particularly in genetic studies, where exact species identification is difficult. It's typically based on genetic similarity rather than morphological traits.

1. **What is biomass energy?**

**Biomass Energy:**

Biomass energy is the energy produced from organic materials such as plant and animal waste. It can be converted into electricity, heat, or biofuels through processes like combustion, fermentation, or gasification.

1. **Define soil erosion and its types**

**Soil Erosion and Its Types:**

Soil Erosion: The removal of the topsoil layer by wind, water, or human activity, leading to loss of soil fertility.

**Types of Soil Erosion:**

Water Erosion: Caused by rainfall and surface runoff.

Wind Erosion: Caused by wind blowing away loose soil.

Human-Induced Erosion: Caused by agricultural practices or deforestation.

1. **Define desertification.**

**Desertification:**

Desertification is the process of land degradation in arid, semi-arid, and dry sub-humid areas, resulting from various factors such as climate change, deforestation, and poor land management, leading to the expansion of desert-like conditions.

1. **What is meant by bioconversion of pollutants?**

**Bioconversion of Pollutants:**

Bioconversion of pollutants refers to the process where microorganisms or biological organisms convert harmful pollutants, such as organic waste or toxic chemicals, into less harmful substances or resources, often through processes like biodegradation or bioremediation.

1. **Differentiate coal power and nuclear power.**

* Coal Power: Uses the combustion of coal to generate heat, which then drives steam turbines to produce electricity. It produces greenhouse gases and other pollutants.
* Nuclear Power: Uses nuclear reactions (typically fission) to generate heat, which then drives turbines to produce electricity. It does not produce greenhouse gases but produces radioactive waste.

**UNIT IV SUSTAINABILITY AND MANAGEMENT**

**PART-A**

1. **Define sustainable development**

**Sustainable Development:**

Sustainable development refers to meeting the needs of the present without compromising the ability of future generations to meet their own needs. It focuses on balancing economic growth, environmental protection, and social equity.

1. **What are the causes of urbanization?**

**Causes of Urbanization:**

Urbanization occurs due to various factors, including:

1. **Economic Opportunities**: Job availability and better income prospects in cities attract people.
2. **Industrialization**: Growth of industries in urban areas leads to migration from rural areas.
3. **Better Services**: Cities offer better healthcare, education, transportation, and infrastructure.
4. **Rural-Urban Migration**: People move from rural areas seeking a better quality of life.
5. **Improved Living Standards**: Cities often offer improved living conditions and access to modern amenities.
6. **List out the need of rain water harvesting.**
7. **Conservation of Water**: Helps in conserving water and reducing dependency on conventional water sources.
8. **Prevents Flooding**: Reduces surface runoff and mitigates flooding.
9. **Groundwater Recharge**: Increases the replenishment of groundwater supplies.
10. **Sustainable Water Supply**: Provides an alternative source of water during dry periods.
11. **Reduces Water Scarcity**: Particularly beneficial in areas with limited water resources.
12. **Cost-Effective**: Lowers the cost of water bills and reduces the need for water treatment.
13. **What are the factors affect watershed?**

**The factors affecting a watershed include:**

Climate: Temperature, rainfall, and weather patterns influence water availability and flow.

Topography: The shape and slope of the land affect water flow and runoff.

Soil Type: Soil composition and permeability affect water infiltration and runoff.

Land Use: Urbanization, agriculture, and deforestation can alter the natural flow of water.

Vegetation: Plants help in water absorption and reduce surface runoff.

Human Activities: Activities like construction, mining, and deforestation can degrade a watershed's health.

1. **Define consumerisation. (nov-15)**

Consumerisation refers to the process through which products, services, or technologies that were originally available to businesses or organizations become accessible and popular among individual consumers. This trend often leads to the mass adoption of innovations and products in everyday life. For example, consumer electronics like smartphones and personal computers were once mainly used by businesses but are now widely used by individuals.

1. **List out the principles of green chemistry.**

Prevention: Avoid waste generation.

Atom Economy: Maximize material usage in products.

Less Hazardous Synthesis: Use safer methods.

Design Safer Chemicals: Create safer, effective chemicals.

Safer Solvents: Avoid harmful solvents.

1. **Define air prevention and control of pollution act.**

**Air (Prevention and Control of Pollution) Act:**

The Air (Prevention and Control of Pollution) Act, 1981 is a legislation in India aimed at controlling and reducing air pollution. The act empowers the government to set standards for air quality and regulate emissions from industries, vehicles, and other sources, ensuring the protection of public health and the environment.

1. **state any two biomedical waste handling rules.**

**Two Biomedical Waste Handling Rules:**

Segregation: Biomedical waste must be segregated into different categories (e.g., infectious, non-infectious, sharp waste) at the point of generation.

Disposal: Biomedical waste must be disposed of safely through methods like incineration, autoclaving, or deep burial, in compliance with the prescribed guidelines.

1. **Define disaster management. CO4 K1 PART**

Disaster Management refers to the organized efforts and processes to prepare for, respond to, and recover from natural or man-made disasters. It involves planning, coordination, and resources to reduce the impact of disasters on people, property, and the environment.

1. **Define the objectives of wildlife act and forest act.**

**Objectives of the Wildlife Protection Act (1972):**

* Protect wild animals, birds, and plants to ensure their survival and conservation.
* Regulate hunting and poaching of wildlife.
* Establish protected areas like national parks, wildlife sanctuaries, and biosphere reserves.
* Promote the sustainable use of wildlife resources.
* Prevent illegal trade in wildlife and its products.

**Objectives of the Forest Conservation Act (1980):**

* Protect and conserve forests and prevent deforestation.
* Regulate the diversion of forest land for non-forest purposes (e.g., industrial or commercial use).
* Promote sustainable management and conservation of forest resources.
* Ensure ecological balance by controlling unauthorized activities in forest areas.

**UNIT V SUSTAINABILITY PRACTICES**

**PART-A**

1. **Write short notes on population dynamics.**

**Population Dynamics:**

Population dynamics refers to the study of how populations of species change over time and space. It includes the factors that influence the size, structure, and distribution of populations, such as birth rates, death rates, immigration, and emigration. These factors help understand the growth patterns and trends in populations, and how they are affected by environmental, social, and economic conditions.

1. **What are the factors affecting population size?**

**Factors Affecting Population Size:**

The size of a population can be influenced by various factors, including:

Birth Rate: The number of births in a population over a specific period.

Death Rate: The number of deaths in a population during a certain period.

Immigration: The arrival of individuals into a population.

Emigration: The departure of individuals from a population.

1. **What is meant by population stabilization.**

**Population Stabilization:**

Population stabilization refers to the process where a population’s size remains relatively constant over time. It occurs when the birth rate equals the death rate, and there is no significant increase or decrease in the population size. Achieving population stabilization is often a goal for sustainable development, as it ensures a balanced relationship between population size and available resources.

1. **Define the term population explosion and the reason behind it.**

**Population Explosion and Its Reasons:**

Population Explosion refers to the rapid and dramatic increase in the size of a population, particularly in a short period. This phenomenon is most noticeable in developing countries.

**Reasons for Population Explosion:**

* High Birth Rates: In many regions, cultural and social factors encourage larger families.
* Decline in Death Rates: Improvements in healthcare, sanitation, and nutrition reduce mortality rates.
* Increased Life Expectancy: Medical advancements and better living conditions lead to longer life spans.
* Lack of Family Planning: Limited access to family planning education and resources leads to uncontrolled population growth.

1. **Define Zero Population growth.**

**Zero Population Growth (ZPG):**

Zero Population Growth refers to a situation where the number of births in a population equals the number of deaths, resulting in no net change in the population size over time. This means the birth rate and death rate are balanced, and the population remains stable.

1. **Define EIA**

**EIA (Environmental Impact Assessment):**

Environmental Impact Assessment (EIA) is a process used to evaluate the potential environmental effects of a proposed project or development before it is carried out. It involves the systematic analysis of a project’s impact on the environment, including factors like air, water, soil, biodiversity, and human health. The goal is to minimize negative environmental effects and promote sustainable development.

1. **What is GIS?**

**GIS (Geographic Information System):**

GIS (Geographic Information System) is a technology used for gathering, managing, analyzing, and visualizing geographic data. It integrates spatial data (such as maps, satellite imagery, and GPS coordinates) with other data types to analyze patterns, trends, and relationships in a specific geographical area. GIS is widely used in environmental management, urban planning, disaster management, and resource management.

1. **Define (i) Toxins (ii) Carcinogens (iii) Tetrogenic (iv) Neurotoxins.**

* **Toxins**: Toxins are harmful substances produced by living organisms, such as plants, animals, or microorganisms, that can cause adverse effects on living organisms when absorbed, inhaled, or ingested.
* **Carcinogens**: Carcinogens are substances or agents that have the potential to cause cancer in living organisms. These may include chemicals, radiation, or certain viruses.
* **Teratogenic**: Teratogenic substances are those that can cause birth defects or abnormalities in developing embryos or fetuses. These substances can disrupt normal fetal development during pregnancy.
* **Neurotoxins**: Neurotoxins are toxic substances that specifically target and damage the nervous system. They can lead to neurological diseases or impair cognitive and motor functions.

1. **State how environment & human health are related?**

**The environment and human health are closely interconnected.**

Air Quality: Poor air quality can lead to respiratory diseases, cardiovascular issues, and increased risk of cancer.

Water Quality: Contaminated water can cause diseases such as cholera, dysentery, and other gastrointestinal infections.

Exposure to Pollutants: Exposure to harmful chemicals, such as pesticides or industrial pollutants, can cause long-term health effects, including cancers, neurological disorders, and developmental problems.

1. **What do you mean by remote sensing?**

Remote Sensing refers to the process of collecting information about an object or area without making physical contact with it. It involves the use of satellite or aerial sensors to capture data about the Earth's surface and atmosphere**.**