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MALABAR POLYTECHNIC CAMPUS CHERPULASSERY
DIPLOMA EXAMINATION - OCT 2018
THIRD SEMESTER DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

Time: 3hrs

Max marks: 100

PART A

Answer the following questions in one or two sentences each carries 2 mark.

1. Define Eutrophication.

Excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life.

2. What is ecological pyramid?

An ecological pyramid (also trophic pyramid, eltonian pyramid, energy pyramid, or sometimes food pyramid) is a graphical representation designed to show the biomass or bio productivity at each trophic level in a given ecosystem.

3. Define air pollution.

Air pollution occurs when harmful or excessive quantities of substances including gases, particulates, and biological molecules are introduced into Earth's atmosphere. It may cause diseases, allergies and even death to humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Both human activity and natural processes can generate air pollution.

4. What is land slide

A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity.

5. Define vulnerability.

Vulnerability refers to the inability (of a system or a unit) to withstand the effects of a hostile environment. A window of vulnerability (WOV) is a time frame within which defensive measures are diminished, compromised or lacking

PART –B

I. Answer the following questions. Each carries 6 marks.

1. Explain land slide and its causes

A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity.

CAUSES:

- Weathered materials
- Sheared materials
- Jointed or fissured materials
- Adversely orientated discontinuities
- Permeability contrasts
- Material contrasts
- Rainfall and snow fall
- Earthquake

2. Discuss the problem affecting food security.

Food security occurs when all people are able to access enough safe and nutritious food to meet their requirements for a healthy life, in ways the planet can sustain into the future. However, food security faces a number of challenges across both production and consumption which research will be essential to solve.

- Risks to food security
 - Fossil fuel dependence
 - Homogeneity in the global food supply
 - Price setting
 - Land use change
 - Global catastrophic risks
 - Agricultural subsidies in the United States

3. Explain different types of ecosystem.

- **Forest Ecosystems.** Forest ecosystems are classified according to their climate type as tropical, temperate or boreal. ...
- **Grassland Ecosystems.** Different types of grassland ecosystems can be found in prairies, savannas and steppes. ...
- **Desert Ecosystems. ...**
A desert ecosystem is a community of organisms that live together in an environment that seems to be deserted wasteland. A desert ecosystem is generally witnesses little rainfall, resulting in less vegetation than in more humid areas of the globe.
- **Tundra Ecosystems. ...**
Tundra's are among Earth's coldest, harshest biomes. Tundra ecosystems are treeless regions found in the Arctic and on the tops of mountains, ..
- **Freshwater Ecosystems.**
Freshwater ecosystems are a subset of Earth's aquatic ecosystems. They include lakes and ponds, rivers, streams, springs, and wetlands. They can be contrasted with marine ecosystems, which have a larger salt content.
- **Marine Ecosystems.**

Marine ecosystems are among the largest of Earth's aquatic **ecosystems**. Examples include salt marshes, intertidal zones, estuaries, lagoons, mangroves, coral reefs, the deep sea, and the sea floor. They can be contrasted with freshwater **ecosystems**, which have a lower salt content.

4. What are the sources of marine pollution

- Sediments: Soil erosion due to agriculture and mining causes marine pollution. ...
- Sewage: advertisements: ...
- Industrial wastes: Industrial wastes that find their way into the sea and oceans pollute the waters.
- Toxins: ...
- Oil spills: ...
- Thermal pollution:

5. Describe sources of thermal pollution

1. Nuclear power plants
2. Coal fired plants
3. Industrial effluents
4. Domestic sewage
5. Hydro-electric power

1. Nuclear power plants: Nuclear power plants including drainage from hospitals, research institutions, nuclear experiments and explosions, discharge a lot of heat that is not utilized along with traces of toxic radio nuclides into nearby water streams. Emissions from nuclear reactors and processing installations are also responsible for increasing the temperatures of water bodies. The operations of power reactors and nuclear fuel processing units constitutes the major contributor of heat in the aquatic environment. Heated effluents from power plants are discharged at 10 C higher than the receiving water that affects the aquatic flora and fauna.

2. Coal-fired power plants: Coal fired power plants constitute a major source of thermal pollution. The condenser coils in such plants are cooled with water from nearby lakes or rivers.

The resulting heated water is discharged into streams thereby raising the water temperature by 15C. Heated effluent decreases the dissolved content of water resulting in death of fish and other aquatic organisms. The sudden fluctuation of temperature also leads to "*thermal shock*" killing aquatic life that has become acclimatized to living in a steady temperature.

3. Industrial effluents: Industries like textile, paper, pulp and sugar manufacturing release huge amounts of cooling water along with effluents into nearby natural water bodies. The waters polluted by sudden and heavy organic loads result in severe drop in levels of dissolved oxygen leading to death of several aquatic organisms.

4. Domestic Sewage: Domestic sewage is discharged into rivers, lakes, canals or streams with minimal treatment or without any treatment. These wastes have a higher organic temperature and organic load. This leads to decrease in dissolved oxygen content in the receiving waters resulting in the set-up of anaerobic conditions causing release of foul and offensive gases in water. Eventually, this leads to development of anoxic conditions resulting in rapid death of aquatic organisms.

5. Hydro-electric power: Generation of hydroelectric power sometimes leads to negative thermal loading in water systems. Apart from electric power industries, various factories with cooling requirement contribute to thermal loading

6. List environmental effect of draught

The environment is directly impacted by drought. Drought can affect water sources, land, fish and wildlife and plant communities.

Drought can result in lower water levels in reservoirs, lakes and ponds, as well as reduced streamflow in rivers. This decrease in available water can also lead to a reduction of some wetlands, groundwater depletion and even impact water quality (e.g. salt concentration can increase).

Inadequate water supply can result in reduced ability for soils to support crops, an increased amount of dust due to dryness, erosion, and a greater chance of wildfires due to the dry landscape.

A lack of water and reduced ability for soil to support crops can affect fish, animals and plant life. Wildlife habitat may become degraded because poor soil quality and inadequate water may affect plant growth, and there may not be enough drinking water for animals. There may also be stress placed on endangered species and a loss of biodiversity in the affected area.

7. Describe the mitigation strategy for flood disaster

In environmental engineering, the flood mitigation involves the management and control of flood water movement, such as redirecting flood run-off through the use of floodwalls and flood gates, rather than trying to prevent floods altogether. It also involves the management of people, through measures such as evacuation and dry/wet proofing properties. The prevention and mitigation of flooding can be studied on three levels: on individual properties, small communities, and whole towns or cities. The costs of protection rise as more people and property are protected.

PART –C

Answer any one full question. Each carries 15 marks.

UNIT- 1

III.(A) Demonstrate problem due to deforestation

Deforestation can have a negative impact on the environment. The most dramatic impact is a loss of habitat for millions of species. Eighty percent of Earth's land animals and plants live in forests, and many cannot survive the deforestation that destroys their homes. Deforestation also drives climate change. Deforestation can have a negative impact on the environment. The most dramatic impact is a loss of habitat for millions of species. Eighty percent of Earth's land animals and plants live in forests, and many cannot survive the deforestation that destroys their homes.

Deforestation also drives climate change. Forest soils are moist, but without protection from sun-blocking tree cover, they quickly dry out. Trees also help perpetuate the water cycle by returning water vapor to the atmosphere. Without trees to fill these roles, many former forest lands can quickly become barren deserts.

(B) Appraise modern agriculture technology

Agricultural technology refers to technology for the production of machines used on a farm to help with farming. Agricultural machines have been designed for practically every stage of the agricultural process. They include machines for tilling the soil, planting seeds, irrigating the land, cultivating crops, protecting them from pests and weeds, harvesting, threshing grain, livestock feeding, and sorting and packaging the products. People who are trained to design agricultural machinery, equipment, and structures are known as agricultural engineers.

Agricultural technology is among the most revolutionary and impactful areas of modern technology, driven by the fundamental need for food and for feeding an ever-growing population. It has opened an era in which powered machinery does the work formerly performed by people and animals (such as oxen and horses). These machines have massively increased farm output and dramatically changed the way people are employed and produce food worldwide. A well-known example of agricultural machinery is the tractor. Currently, mechanized agriculture also involves the use of airplanes and helicopters.

OR

IV (a) Analyse disadvantage of larger dams.

Soil Erosion

One of the first problems with dams is the erosion of land. Dams hold back the sediment load normally found in a river flow, depriving the downstream of this. In order to make up for the sediments, the downstream water erodes its channels and banks. This lowering of the river bed threatens vegetation and river wildlife..

One of the reasons dams are built is to prevent flooding. However, most ecosystems which experience flooding are adapted to this and many animal species depend on the floods for various lifecycle stages, such as reproduction and hatching. Annual floods also deposit nutrients and replenish wetlands.

Species Extinction

As fisheries become an increasingly important source of food supply, more attention is being paid to the harmful effects of dams on many fish and marine mammal populations. The vast majority of large dams do not include proper bypass systems for these animals, interfering with their lifecycles and sometimes even forcing species to extinction.

Spread of Disease

Dam reservoirs in tropical areas, due to their slow-movement, are literally breeding grounds for mosquitoes, snails, and flies, the vectors that carry malaria, schistosomiasis, and river blindness.

Changes to Earth's Rotation

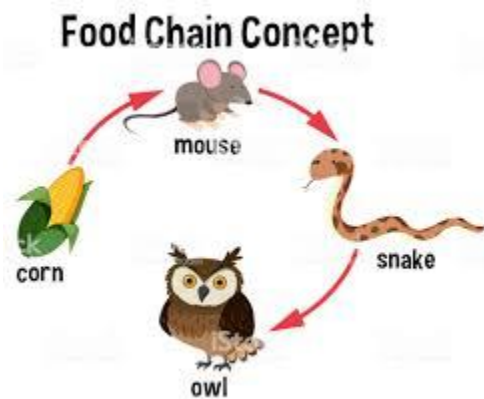
Nasa geophysicist Dr. Benjamin Fong Chao found evidence that large dams cause changes to the earth's rotation, because of the shift of water weight from oceans to reservoirs. Because of the number of dams which have been built, the Earth's daily rotation has apparently sped up by eight-millionths of a second since the 1950s. Chao said it is the first time human activity has been shown to have a measurable effect on the Earth's motion.

(b).The use of minerals: In agriculture: Many **minerals** like gypsum, Zinc, potassium, phosphate, sulfur are widely **used** in agriculture. They are applied as fertilizers to aid better yield. ... These substances are made of many **minerals** like calcium oxide, aluminum oxide, silica, gypsum etc.

UNIT -II

V (a) Discuss the basic concept of food chain

A food chain is a **linear** sequence of organisms through which nutrients and energy pass as one organism eats another. In a food chain, each organism occupies a different trophic level, defined by how many energy transfers separate it from the basic input of the chain.



(b) Write down the characteristics of forest ecosystem

Forest Ecosystems:

Different organisms exist within the forest layers. These organisms interact with each other and their surroundings. Each organism has a role or niche in sustaining the ecosystem.

Some provide food for other organisms; others provide shelter or control populations through predation:

Producers:

All living organisms' intake energy in order to survive. In a forest ecosystem, trees and other plants get their energy from sunlight. Plants produce their own food, in the form of carbohydrates. Plants are, therefore, called the primary producers, since they produce the basic foodstuffs for other organisms within food chains and food webs. Photosynthesis is the chemical reaction that allows plants to produce their own food.

Consumers:

Animals cannot produce their own food. They must consume food sources for the energy they need to survive. All animals, including mammals, insects, and birds, are called consumers. Consumers rely on plants and other animals as a food source. Details of these animals in a forest ecosystem have been given earlier.

Primary consumers only eat plants and are referred to as herbivores. Secondary consumers are referred to as carnivores and feed on herbivores. Tertiary consumers are carnivores that feed on other carnivores. Omnivores eat both plant and animal matter.

Decomposers:

Leaves, needles, and old branches fall to the forest floor as trees grow. Eventually all plants and animals die. So what happens to all of this plant and animal material? Does it sit on the forest floor forever? Thankfully no. These materials are decomposed by worms, microbes, fungi, ants, and other bugs.

Decomposers break these items down into their smallest primary elements to be used again. Decomposers are important in that they sustain the nutrient cycle of ecosystems.

Humans are part of Forest Ecosystem:

Humans are consumers. We get food and materials from forests. Because of this, we are a part of the forest ecosystem. Human consumption alters forest ecosystems. Human intervention may be necessary to sustain forest communities under the increased pressure of human use.

OR

VI (a) Describe ecological succession

Ecological succession is the process of change in the species structure of an ecological community over time. The time scale can be decades (for example, after a wildfire), or even millions of years after a mass extinction.

The community begins with relatively few pioneering plants and animals and develops through increasing complexity until it becomes stable or self-perpetuating as a climax community. The "engine" of succession, the cause of ecosystem change, is the impact of established species upon their own environments. A consequence of living is the sometimes subtle and sometimes overt alteration of one's own environment.

It is a phenomenon or process by which an ecological community undergoes more or less orderly and predictable changes following a disturbance or the initial colonization of a new habitat. Succession may be initiated either by formation of new, unoccupied habitat, such as from a lava flow or a severe landslide, or by some form of disturbance of a community, such as from a fire, severe wind throw, or logging. Succession that begins in new habitats, uninfluenced by pre-existing communities is called primary succession, whereas succession that follows disruption of a pre-existing community is called secondary succession.

Succession was among the first theories advanced in ecology. The study of succession remains at the core of ecological science. Ecological succession was first documented in the Indiana Dunes of Northwest Indiana which led to efforts to preserve the Indiana Dunes. Exhibits on ecological succession are displayed in the Hour Glass, a museum in Ogden Dunes.

(b) Explain consumer based on their mode of consumption

The four types of consumers in ecology are herbivores, carnivores, omnivores, and decomposers. Herbivores are consumers who only eat vegetables, plants, grass, or some type of vegetation.

- **Primary consumers (herbivores)**

These are organisms which feeds on the producers or autotrophic organisms (plants)for their energy .eg. Cow, goat, elephants etc

- **Secondary consumers (carnivores)**

These feeds on primary consumers for their energy .eg., dogs,snakes,owls. The organisms which feed on both producers and consumers is als known secondary consumers (omnivores) eg., Human, bears etc

- **Tertiary consumers (large carnivores)**

These are carnivores that feed only on secondary consumers.eg., lion, tiger, eagle etc

- **Decomposers (microconsumers)**

Decomposers are the organisms that break down the cells of dead plants and animals into simpler substance.eg. Certain kinds of bacteria, actinolites, worms, slugs

UNIT - 3

VII (a) what are the sources of water pollution?

- Sewage (Waste Water) Sewage is another name for waste water from domestic and industrial processes. ...
- Agricultural Pollution. ...
- Oil Pollution. ...
- Radioactive Substances. ...
- River dumping. ...
- Marine Dumping.

(b) Describe briefly on sewage treatment process

Sewage treatment is the process of removing contaminants from municipal wastewater, containing mainly household sewage plus some industrial wastewater. Physical, chemical, and biological processes are used to remove contaminants and produce treated wastewater (or treated effluent) that is safe enough for release into the environment. A by-product of sewage treatment is a semi-solid waste or slurry, called sewage sludge. The sludge has to undergo further treatment before being suitable for disposal or application to land.

Sewage treatment may also be referred to as wastewater treatment. However, the latter is a broader term which can also refer to industrial wastewater. For most cities, the sewer system will also carry a proportion of industrial effluent to the sewage treatment plant which has usually received pre-treatment at the factories themselves to reduce the pollutant load. If the sewer system is a combined sewer then it will also carry urban runoff (storm nwater) to the sewage treatment plant. Sewage water can travel towards treatment plants via piping and in a flow aided by gravity and pumps. The first part of filtration of sewage typically includes a bar screen to filter solids and large objects which are then collected in dumpsters and disposed of in landfills. Fat and grease is also removed before the primary treatment of sewage.

OR

VIII (a) Discuss various method of solid waste management.

- Open burning
- Dumping into the sea

- Sanitary Landfills
- Incineration
- Composting
- Ploughing in fields
- Hog feeding
- Grinding and discharging into sewers
- Salvaging
- Fermentation and biological digestion

Open burning of Solid Wastes

Not an ideal method in the present day context

Dumping into Sea

- Possible only in coastal cities
- Refuse shall be taken in barges sufficiently far away from the coast (15-30 km) and dumped there
- Very costly
- Not environment friendly

Sanitary Land filling of Solid Wastes

- Simple, cheap, and effective
- A deep trench (3 to 5 m) is excavated
- Refuse is laid in layers
- Layers are compacted with some mechanical equipment and covered with earth, leveled, and compacted
- With time, the fill would settle
- Microorganisms act on the organic matter and degrade them
- Decomposition is similar to that in composting
- Facultative bacteria hydrolyze complex organic matter into simpler water soluble organics
- These diffuse through the soil where fungi and other bacteria convert them to carbon dioxide and water under aerobic conditions
- Aerobic methanogenic bacteria utilize the methane generated and the rest diffuses into the atmosphere
- Too much refuse shall not be buried – fire hazard
- Moisture content – not less than 60% for good biodegradation

- Refuse depth more than 3m – danger of combustion due to compression of bottom layers – hence should be avoided
- Refuse depth is generally limited to 2m
- Temperature in the initial stages of decomposition – as high as 70 degree C – then drops
- Reclaimed areas may be used for other uses

Engineered Landfills of Solid Wastes

- Bottom of the trench is lined with impervious material to prevent the leachate from contaminating groundwater
- A well designed and laid out leach ate collection mechanism is to be provided
- Leachate so collected is treated and then disposed off

(b) What are the sources of pollution?

Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people in the world.

Major forms of pollution include: Air pollution, light pollution, littering, noise pollution, plastic pollution, soil contamination, radioactive contamination, thermal pollution, visual pollution, water pollution.

UNIT- 4

IX (a) what is TREM card and explain the emergency procedure in truck/tanker accidents.

Transport Emergency Cards (TREM Cards) are cards that workers carry at all times when their work involves transporting hazardous wastes. These cards are provided by the occupier or operator of a facility and must be kept in the cab of any vehicle transporting dangerous goods, unless they are in sufficiently low quantities.

TREM Cards carry information about the particular goods being transported and provide instructions to the driver or emergency responders in the event of an incident.

(B) List causes and consequences of nuclear explosion.

Depending on the design of the weapon and the environment in which it is detonated the energy distributed to these categories can be increased or decreased. The blast effect is created by the coupling of immense amounts of energy, spanning the electromagnetic spectrum, with the surroundings. Locations such as submarine, ground burst, air burst, or exo-atmospheric determine how much energy is produced as blast and how much as radiation. In general, denser

media around the bomb, like water, absorb more energy, and create more powerful shockwaves while at the same time limiting the area of its effect.

When an air burst occurs, lethal blast and thermal effects proportionally scale much more rapidly than lethal radiation effects, as higher and higher yield nuclear weapons are used.

The physical-damage mechanisms of a nuclear weapon (blast and thermal radiation) are identical to those of conventional explosives, but the energy produced by a nuclear explosive is millions of times more powerful per gram and the temperatures reached are briefly in the tens of millions of degrees.

Energy from a nuclear explosive is initially released in several forms of penetrating radiation. When there is a surrounding material such as air, rock, or water, this radiation interacts with and rapidly heats it to an equilibrium temperature (i.e. so that the matter is at the same temperature as the atomic bombs matter). This causes vaporization of surrounding material resulting in its rapid expansion. Kinetic energy created by this expansion contributes to the formation of a shockwave. When a nuclear detonation occurs in air near sea level, much of the released energy interacts with the atmosphere and creates a shockwave which expands spherically from the center. Intense thermal radiation at the hypocenter forms a nuclear fireball and if the burst is low enough, it is often associated with a mushroom cloud. In a burst at high altitude, where the air density is low, more energy is released as ionizing gamma radiation and x-rays than an atmosphere-displacing shockwave.

OR

(a) Define Bhopal tragedy

The Bhopal disaster, also referred to as the Bhopal gas tragedy, was a gas leak incident on the night of 2–3 December 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh, India. It was considered as of 2010 to be the world's worst industrial disaster.

Over 500,000 people were exposed to methyl isocyanate (MIC) gas. The highly toxic substance made its way into and around the small towns located near the plant.^[2]

Estimates vary on the death toll. The official immediate death toll was 2,259. The government of Madhya Pradesh confirmed a total of 3,787 deaths related to the gas release.^[3] A government affidavit in 2006 stated that the leak caused 558,125 injuries, including 38,478 temporary partial injuries and approximately 3,900 severely and permanently disabling injuries. Others estimate that 8,000 died within two weeks, and another 8,000 or more have since died from gas-related diseases.

The cause of the disaster remains under debate. The Indian government and local activists argue that slack management and deferred maintenance created a situation where routine pipe maintenance caused a backflow of water into a MIC tank, triggering the disaster. Union Carbide Corporation (UCC) argues water entered the tank through an act of sabotage.

(B) Explain land use zone

Zoning is the term used for designating permitted uses of certain parcels of land by local governments. The word is largely self-explanatory: the local government will designate various zones for different uses of land, such as industrial, agricultural, commercial, and residential. Zoning is also frequently used to designate the types of buildings that can be erected in a particular area, such as high density housing, highrises, maximum height restrictions, etc.

The primary philosophy behind zoning regulations is to separate different, incompatible property uses. For example, keeping large, smoke producing factories away from residential neighborhoods. However, in many instances, variances, or exceptions to the zoning rules, are possible. For example, a small residential variance might be granted to allow for a home in an industrial zone to house the night watchman. Usually, variances are granted because of some perceived hardship caused by the particular nature of the property in question or to satisfy a unique need that is not otherwise against the public interests.

Generally, in urban areas, zoning will be divided five major categories: residential, mixed residential-commercial, commercial, industrial, and special (e.g., power plants, sports complexes, airports, shopping malls etc.). Often, these categories will also have a number of sub-categories. For example, within the commercial category there may be separate zones for small-retail, large retail, office use, lodging and others, while industrial may be subdivided into heavy manufacturing, light assembly and warehouse uses.

Of course, zoning laws are not without their critics or misuse. Along with potential property right infringements, zoning has also been criticized as a means to promote social and economic segregation through exclusion. By improper use of various land-use restrictions, such as maximum density requirements, municipalities are able to artificially maintain high housing costs, increasing the tax base while effectively excluding lower income groups.

If you have questions about zoning, land-use, obtaining variances, or fighting government sponsored housing segregation, the resources below will help. As always, there is no substitute for the advice of a local, qualified attorney, and we also offer resources for finding some of the best qualified attorneys in your area.

