

NEW TOPICS ADDED FROM ACADEMIC SESSION 2021-22
FIRST/SECOND SEMESTER
ENVIRONMENTAL STUDIES [BS 109/110]

Q.1. What is wasteland reclamation?

Ans. The degraded land which can be brought under vegetative cover with reasonable effort and which is currently under utilized and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes" is called waste land reclamation.

Categories of wasteland in India:

- Gullies and/or ravines
- Upland with or without scrub
- Waterlogged and marshy land
- Land affected by salinity /alkalinity in coastal and inland areas
- Land under shifting cultivation
- Under utilized / degraded notified forest land
- Degraded pasture / grazing land
- Degraded land under plantation crops
- Shifting sands- inland /coastal
- Mining / industrial wastelands
- Barren rocky / stony waste/ sheet rock areas
- Steep sloping area
- Snow covered and/ or glacial area

Q. 2. What are various method of land reclamation?

Ans. Methods of Wasteland Reclamation

1. Afforestation: It means growing forest in uncultivated lands or wastelands.

2. Reforestation: When the lands are destroyed due to overgrazing and excessive cutting, the forests can be grown again by checking the soil erosion and increasing productivity.

3. Provide surface coverage: By leaving the crop residue on the land after harvesting, the land surface can be protected from soil erosion.

4. Mulching: This is a cover used as a protection of soil by reducing evaporation and soil erosion and also it helps in retaining the soil moisture.

5. Leaching: When a land is a salt-affected land then that can be reduced by leaching of water on it.

6. Changing agricultural practices: This is done for the improvement or better growth of the land. This can be done by making a few crops.

7. Ecological balance: It keeps a balance in the ecosystem and redevelops the wasteland into a productive resource.

Q. 3. What are causes of wasteland reclamation?

Ans. Clearing forests permanently for non forestry activities like human settlement, setting up industries etc.

- Overgrazing
- Improper irrigation practices-Commercial timber exploitation-Shifting cultivation-Use as fuel wood.-Causes of land degradation : use and abuse of our land resource

- Over cultivation
- Deforestation

Q.4. What is need of wasteland reclamation?

Ans. Need for wasteland reclamation

- It provides a source of income for the rural poor.
- It ensures a constant supply of fuel, fodder and timber for local use.
- It makes the soil fertile by preventing soil erosion and conserving moisture.
- The program helps maintain an ecological balance in the area.
- The increasing forest cover helps in maintaining local climatic conditions.

Q.5. What is population growth? What are factors that influence the population fluctuation?

Ans. Population growth is the increase in the number of people in a population.

Factors that Influence Population Fluctuation

The fluctuations in the population in a given area are influenced by four major factors, which include the following:

- **Natality:** It is the number of births in a given period of time in a population.
- **Mortality:** It is defined as the number of deaths that takes place in a population at a given period of time.
- **Immigration:** It is defined as the number of individuals which come from another population and add to the population in consideration during a period of time.
- **Emigration:** It is defined as the number of individuals from a population who leave the habitat and go to a different habitat at a given period of time.

Q.6. What are activities included in family welfare program?

Ans. Family Welfare programme includes the following activities:

1. Sterilization Programme.
2. IUD Programme.
3. Contraceptive Programme.
4. Family Planning Insurance Scheme.
5. Janani Surakshya Yojana.
6. Nutrition programme.
7. Urban Family welfare programme.
8. Urban revamping Scheme.
9. Green card Scheme.
10. Rural Family Welfare centre.

Q.7. What is necessity of women and child care?

Ans. The necessity of women and child care is due to the following reasons:

- (i) Women shoulder a greater part of the household work and toil for longer hours.
- (ii) Women are exposed to dangerous levels of indoor pollution from burning de
biomass fuel.
- (iii) Women are more influenced by environmental degradation than men.
- (iv) Women have special problems with regard to water supply and sanitation.
- (v) Children are more vulnerable toward environmental impacts and child labour
are exposed to hazardous occupations.

Q. 8: Discuss the important program related to women and child welfare?

Ans. Some important developmental programmes relating women and child welfare are discussed below:

1. Support to Training-cum-Employment Programme (STEP): The women are given training in sectors like agriculture, dairying, small animal husbandry, fisheries, khadi and village industries etc. and subsequently engaged.

2. Women's Development Corporation: The objective the scheme is to identify women entrepreneurs, providing them with technical consultancy, arranging training facilities, favoring availability of credits, promoting marketing of products, strengthening women's cooperatives etc.

3. Socio-economic Programme: Under this programme, financial assistance is provided by Central Social Welfare Board to different voluntary organisation for income generating activities, thereby providing service to needy women.

4. Swa-Shakti Project:

- (i) Establishment of self reliant women's self-help group (SHQs).
- (ii) Sensitising and strengthening the institutional capacity of support agencies to fulfill women's need.
- (iii) Establishing relation between SHQs and credit lending institutions.
- (iv) Favoring Women's access to resources for better life.

5. Advocacy and Sensitisation:

Awareness should be created against constantly declining sex ratio, the growing incidence of female feticide, the prevalence of female infanticide and high rates of infant and maternal mortality. Steps should be taken to prevent the above issues from our society.

6. Support through legislation: To safeguard constitutional rights of women, there exist a number of legislations which include Equal Remuneration Act, Commission of Sati Act, Maternity Benefit Act, Immoral Traffic Act, Dowry Prevention Act etc.

7. National Commission for Women: In 1992, National Commission for Women was constituted which protects constitutional and legal rights of women, recommends remedial measures, facilitates redressal of grievances, participates and advises the Government on all matters of policy affecting the welfare and development of women.

8. National Institute of Public Cooperation and CM Development: National Institute of Public Cooperation and CTM Development was established to develop and promote voluntary action in social development, take comprehensive view of child development and develop measures for coordination of government and voluntary action in social development.

Q. 10. What do you mean by human rights? Discuss various human rights.

Ans. "Human rights" means the rights relating to life, liberty, equality and dignity of the individual guaranteed by the Constitution or embodied in the International Covenants and enforceable by courts in India.

Protection of human rights is essential for the development of the people of the country, which ultimately leads to development of the national as a whole. The Constitution of India guarantees basic human rights to each and every citizen of the

- 1. Right to Equality:** The Right to Equality prohibits inequality on the basis of caste, religion, place of birth, race, or gender.
- 2. Right to Freedom:** These rights are freedom of speech, freedom of expression, freedom of assembly without arms, freedom of movement throughout the territory of our country, freedom of association, freedom to practice any profession, freedom to reside in any part of the country.
- 3. Right against Exploitation:** Right against Exploitation condemns human trafficking, child labor, forced labor making it an offense punishable by law.
- 4. Right to Freedom of Religion:** Right to Freedom of Religion guarantees religious freedom and ensures secular states in India.
- 5. Cultural and Educational Rights:** Cultural and Educational Rights protect the rights of cultural, religious and linguistic minorities by enabling them to conserve their heritage and protecting them against discrimination.
- 6. Right to Constitutional Remedies:** Right to Constitutional Remedies ensures citizens to go to the supreme court of India to ask for enforcement or protection against violation of their fundamental rights.

FIRST TERM EXAMINATION [MARCH-2016]

SECOND SEMESTER [B.TECH]

ENVIRONMENTAL STUDIES [ETEN-114]

Time : 1½ hrs.

M.M. : 30

Note: Attempt Q No.1 which is compulsory and any two more questions from the remaining.

Q.1. (a) Write and explain the objectives of environmental studies. (2.5)

Ans. Main Objectives of Environmental Studies are given below:

- (i) Acquire an awareness of the environment as a whole and its related problems.
- (ii) Gain a variety of experiences and acquire a basic understanding and knowledge about the environment and its allied problems.
- (iii) Acquire an attitude of concern for the environment.
- (iv) Acquire the skills for identifying and solving environmental problems.
- (v) Participate in improvement and protection of environment.
- (vi) Develop the ability to evaluate measures for the improvement and protection of environment.

To sum up, the objectives of environmental studies are to develop a world in which persons are aware of and concerned about environment and the problems associated with it, and committed to work individually as well as collectively towards solutions of current problems and prevention of future problems.

Q.1. (b) What is Ground water aquifer ? Define Water Table. (2.5)

Ans. An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a water well. The study of water flow in aquifers and the characterization of aquifers is called hydrogeology. A well is a hole drilled into the ground to penetrate an aquifer. Normally such water must be pumped to the surface. If water is pumped from a well faster than it is replenished, the water table is lowered and the well may go dry. When water is pumped from a well, the water table is generally lowered into a cone of depression at the well. Groundwater normally flows down the slope of the water table towards the well.

Water table, also called **Groundwater Table**, upper level of an underground surface in which the soil or rocks are permanently saturated with water. The water table separates the groundwater zone that lies below it from the capillary fringe, or zone of aeration, that lies above it. The water table fluctuates both with the seasons and from year to year because it is affected by climatic variations and by the amount of precipitation used by vegetation. It also is affected by withdrawing excessive amounts of water from wells or by recharging them artificially.

The water table is the surface where the water pressure head is equal to the atmospheric pressure (where gauge pressure = 0). It may be visualized as the "surface" of the subsurface materials that are saturated with groundwater in a given vicinity.

Q.1. (c) Differentiate between food chain and food web with example. (2.5)

Ans. A food chain is a single series of organisms in which each plant or animal depends on the organism above or below it. As an example, a food chain might consist of garden plants, such as lettuce and carrots, fed upon by rabbits which, in turn, are fed upon by owls which, in turn, are fed upon by hawks. A food chain is largely a theoretical idea and probably seldom, if ever, exists in the real world. It is a useful concept, however, as it helps ecologists understand how specific plants and animals are dependent upon

one another. The feeding relationships of organisms in the real world is almost always more complex than suggested by a food chain. For that reason, the term food web is more accurate than is food chain.

EXAMPLE:

THE SUN provides food for GRASS

The GRASS is eaten by a GRASSHOPPER

The GRASSHOPPER is eaten by a FROG

The FROG is eaten by a SNAKE

The SNAKE is eaten by a HAWK.

A food web differs from a food chain in that it includes all the organisms whose feeding habits are related in some way or another to those of other organisms. In the example above, small animals other than rabbits feed on lettuce and carrots and in turn, those animals are fed upon by a variety of larger animals.

Food webs are organized into three main categories, depending on the kind of organisms they contain. These three categories are known as trophic levels. The primary trophic levels are those that consist of (1) Producers, (2) Consumers, and (3) Decomposers

EXAMPLE:

TREES produce ACORNS which act as food for many MICE and INSECTS.

Because there are many MICE, WEASELS and SNAKES have food.

The insects and the acorns also attract BIRDS, SKUNKS, and OPOSSUMS.

With the SKUNKS, OPPOSUMS, WEASELS and MICE around, HAWKS, FOXES and OWLS can find food.

They are all connected! Like a spiders web, if one part is removed, it can affect the whole web.

Q.1. (d) Define and explain in-situ and ex- situ biodiversity conservation

Ans. Ex-Situ Conservation: Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. This involves conserving genetic resources, as well as wild and cultivated species, and draws on a diverse range of techniques and facilities. Such strategies include establishment of botanical gardens, zoos, conservation strands and gene banks, pollen seed, seedling, tissue culture and gene banks.

In-situ Conservation: In-situ conservation is on site conservation of genetic resources in natural populations of plant or animal species such as forest genetic resources in natural populations of tree species. It is the process of protecting an endangered plant or animal species in its natural habitat either by protecting or cleaning up the habitat itself, or by defending the species from predators.

It is applied to conservation of agricultural biodiversity in agro forestry by farmers especially those using unconventional farming practices. In-situ conservation is done by declaring area as protected area.

In India following types of natural habitats are being maintained

1. National parks
2. Wildlife sanctuaries
3. Biosphere reserves

INDIA has over 600 protected areas, which includes over 90 national parks, 500 animal sanctuaries and 15 biosphere reserves.

Q.1. (e) What is soil erosion ? Briefly explain different soil conservation methods. (2.5)

Ans. **Soil erosion** is the washing or blowing away (by water or wind) of the top layer of soil (dirt). Soil erosion is one form of soil degradation. The erosion of soil is a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks.

While erosion is a natural process, human activities have increased by 10-40 times the rate at which erosion is occurring globally. Excessive (or accelerated) erosion causes both "on-site" and "off-site" problems. On-site impacts include decreases in agricultural productivity and (on natural landscapes) ecological collapse, both because of loss of the nutrient-rich upper soil layers. In some cases, the eventual end result is desertification. Off-site effects include sedimentation of waterways and eutrophication of water bodies, as well as sediment-related damage to roads and houses. Water and wind erosion are the two primary causes of land degradation; combined, they are responsible for about 84% of the global extent of degraded land, making excessive erosion one of the most significant environmental problems world-wide.

Different method of soil conservation

1. Afforestation: It means growing the forest over culturable wasteland.

2. Reforestation: Growing the forest again over the lands where they were existing and was destroyed due to fires, overgrazing, and excessive cutting. Reforestation checks water logging, floods, soil erosion and increase productivity of land.

3. Providing surface cover: The easiest way to protect the land surface from soil erosion is of leave crop residue on the land after harvesting.

4. Mulching: Here also protective cover of organic matter and plants like stalks, cotton stalks, tobacco stalks etc. are used which reduce evaporation, help in retaining soil moisture and reduce soil erosion.

5. Changing Ground Topography on Downhill's: Running water erodes the hill soil and carries the soil along with it. This can be minimized by following alternation in ground topography:

(a) **Strip farming:** Different kinds of crops are planted in alternate strip along the contour.

(b) **Terracing:** In this arrangement, the earth is shaped in the form of levelled terraces to hold soil and water. The terrace edges are planted with such plant species which anchor the soil.

(c) **Contour ploughing:** In this arrangement, the ploughing of land is done across the hill and not in up and down style.

6. Leaching: In salt affected land, the salinity can be minimized by leaching them with more water.

7. Changing agricultural practices: Like mixed cropping, crop rotation and cropping of plants are adopted to improve soil fertility.

8. Ecological Succession: This refers to the natural development or redevelopment of an ecosystem which help in reclaiming the mineralily deficient soil of wasteland.

Q.2. (a) Discuss the process of Ecological Succession. (4)

Ans. Ecological succession is the gradual process by which ecosystems change and develop over time. Nothing remains the same and habitats are constantly changing.

- The species living in a particular place gradually change over time as does the physical and chemical environment within that area.
- Succession takes place because through the processes of living, growing and reproducing, organisms interact with and affect the environment within an area gradually changing it.
- Each species is adapted to thrive and compete best against other species under a very specific set of environmental conditions. If these conditions change, then the existing species will be outcompeted by a different set of species which are better adapted to the new conditions.
- Change in the plant species present in an area is one of the driving forces behind changes in animal species. This is because each plant species will have associated animal species which feed on it. The presence of these herbivore species will then dictate which particular carnivores are present.
- Succession occurs on many different timescales, ranging from a few days to hundreds of years.

There are two main types of succession, primary and secondary.

Primary succession is the series of community changes which occur on an entire new habitat which has never been colonized before. For example, a newly quarried rock face or sand dunes.

Secondary succession is the series of community changes which take place on previously colonized, but disturbed or damaged habitat. For example, after felling trees in a woodland, land clearance or a fire.

Q.2. (b) 'The flow of energy is one way and continuous in Ecosystem. Justify'

Ans. The flow of energy is one way and continuous in an ecosystem: Energy flow is the amount of energy that moves through a food chain. The largest source of energy for an ecosystem is the sun. Energy and nutrients are passed around through the food chain, when one organism eats another organism. Any energy remaining in a dead organism is consumed by decomposers. An example of energy flow in an ecosystem would begin with the autotrophs that take energy from the sun. Herbivores then feed on the autotrophs and change the energy from the plant into energy that they can use. Carnivores subsequently feed on the herbivores and, finally, other carnivores prey on the carnivores.

In each case, energy is passed on from one trophic level to the next trophic level. However, each time some energy is lost as heat into the environment. This is due to the fact that each organism must use some energy that they received from other organisms in order to survive. The top consumer of a food chain will be the organism that receives the least amount of energy.

Q.2. (c) What are the major threats to Biodiversity . Explain giving real life examples.

Ans. Some of the main threats to biodiversity are:

- Human Activities and Loss of Habitat,
- Deforestation,
- Desertification,
- Marine Environment,
- Increasing Wildlife Trade and
- Climate Change.



1. Human Activities and Loss of Habitat: Human activities are causing a loss of biological diversity among animals and plants globally estimated at 50 to 100 times the average rate of species loss in the absence of human activities. Two most popular species in rich biomes are tropical forests and coral reefs. Decreased biodiversity also interferes with essential ecological services such as pollination, maintenance of soil fertility, flood controls, water purification, assimilation of wastes and the cycling of carbon and other nutrients.

2. Deforestation: Current projections suggest that demand for wood will roughly double over the next 50 years, which will make increasing use of sustainable forest practices more difficult. In addition to threats to biodiversity and potential shortages in the supply of forest products, the degradation of forests represents an enormous potential source of green house gas emissions.

3. Desertification: Desertification and deforestation are the main causes of biodiversity loss. Both processes are decisively influenced by the extension of agriculture. The direct cost of deforestation is reflected in the loss of valuable plants and animal species. Desertification process is the result of poor land management which can be aggravated by climatic variations.

4. Marine Environment: In coastal areas, where human activities are concentrated, pollution, over-exploitation of resources, development of critical habitats such as wetlands, and mangroves, and water-flow from poor land-use practices have led to drastic reductions in near shore fisheries production and aquatic biodiversity

5. Climate Change: As climate warms, species will migrate towards higher latitudes and altitudes in both hemisphere. The increase in the amount of CO₂ in the air affects the physiological functioning of plant and species composition. Moreover, aquatic ecosystems, particularly coral reefs, mangrove swamps, and coastal wetlands, are vulnerable to changes in climate.

3. Overexploitation: Overhunting, overfishing and over-harvesting contribute greatly to the loss of biodiversity, killing off numerous species over the past several hundred years. Poaching and other forms of hunting for profit increase the risk of extinction; the extinction of an apex predator — or, a predator at the top of a food chain — can result in catastrophic consequences for ecosystems.

Real life example, nitrogen and phosphorous are important nutrients for plant growth, but when they concentrate in water systems after being applied as agricultural fertilizers, they can cause “dead zones” that are uninhabitable for fish and other wildlife. Also, carbon dioxide is a “natural” component of the atmosphere, but is considered a pollutant when emitted by human industrial activities.

Q.3. (a) Explain how human activities have increased vulnerability to drought. Write about different types of drought. (4)

Ans. Human activities that can help trigger droughts include:

- Widespread cutting down of trees for fuel reduces the soil's ability to hold water drying out the ground, triggering *desertification* and leading to drought.

Of all human activities that have a direct or indirect impact on natural hazards, deforestation is by far the most significant. Deforestation is the removal or destruction of forest cover of an area. One of the major functions of a forest is to maintain the humidity level in the atmosphere. Lack of trees translates to the lack of root fibers that hold the topsoil. In the event of a drought, the topsoil flakes and gets blown by the wind, leading to severe dust storms.

- Constructing a dam on a large river may help provide electricity and water to irrigate farmland near the reservoir. However, it may also cause drought downstream by severely reducing the flow of water.

- Human activity like construction of roads can have a major impact on vulnerability of a mountain slope.

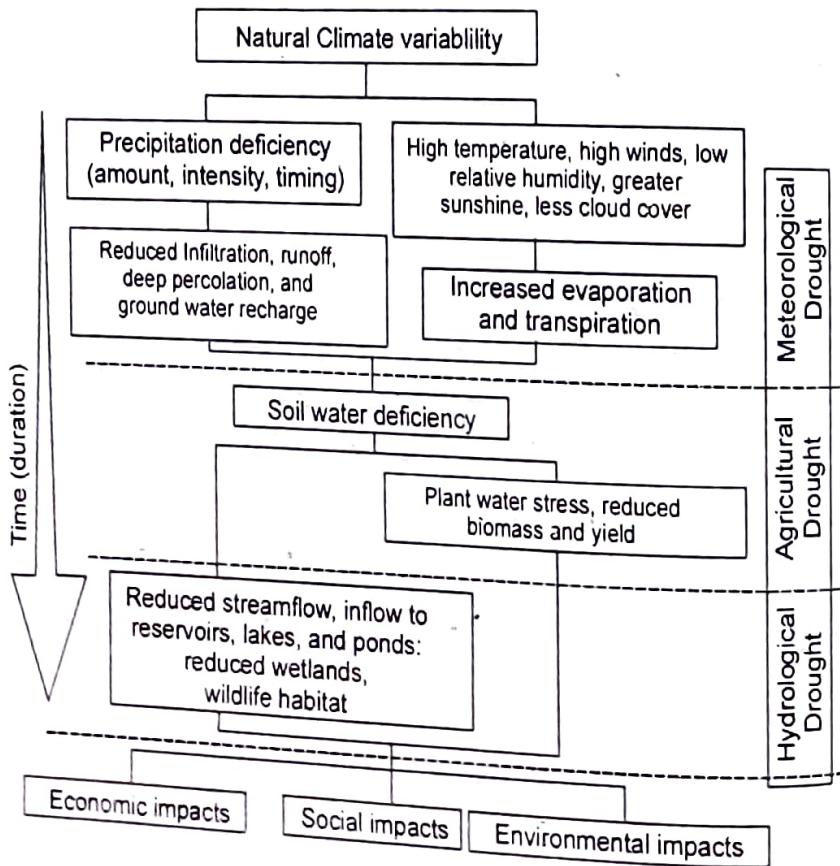
- Another type of mass movement that is seen in plain areas is subsidence. Subsidence is vertical sinking of materials. In many unplanned cities, the city sprawled into areas not covered by municipal water distribution network. indiscriminate ground water usage through bore wells have severely depleted water tables. regions like the Raniganj – Jharia coal belt in India, improper mining excavation and inappropriate filling of excavated tunnels have led to widespread subsidence.

TYPES OF DROUGHT

Meteorological drought: This kind is usually determined by the general lack of moisture in the weather such as lack of precipitation, and the play of other weather conditions such as dry winds, high temperatures and so on. It is expressed in relation to the *average* conditions of the region over a long period of time. It is usually an indicator of potential water crisis if the condition is prolonged. Meteorological drought can be ended immediately.

Agricultural drought: This is when atmospheric moisture is reduced to the extent that soil moisture is affected. Here, crops and animals are affected; evapotranspiration is also affected. It is often the signs one sees when a meteorological drought is at play, but not before a hydrological drought.

Hydrological drought: This is when there is a deficiency of surface water ground water supply in a region, often as a result of less precipitation, excessive reliance on surface water for farming, energy and other needs. Hydrological drought does not usually occur at the same time as meteorological drought. In a way, decline in the quantity and quality of surface and sub-surface water is the effect of meteorological drought.



Q.3. (b) How can we harness energy from ocean ? Explain different methods.

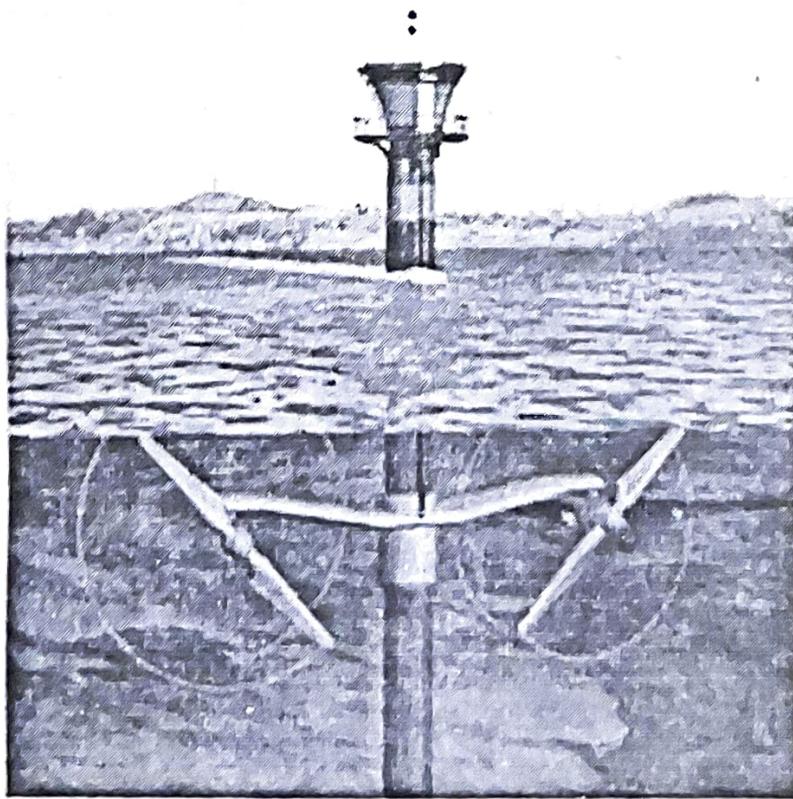
Ans. The two main forms of energy associated with our oceans are: Tidal power and wave power - born of the same source, but different in how they turn energy into electricity.

Tidal Power: Tidal power converts the energy of tides into electricity utilizing the rise and fall of the ocean tides. The stronger the tide, either in water level height or tidal current velocities, the greater the potential for tidal electricity generation.

Tidal power can be classified into two main types; Tidal Stream Systems and Barrages.

- Barrages are similar to hydro-electric dams but are placed in an estuary bay or river mouth, where they act as barriers that create artificial tidal lagoons. When water levels outside the lagoon changes relative to water levels inside, turbines in the barrage are able to produce electrical power. There are only three such structures in the world, the Rance River in France, Canada's Bay of Fundy, and Kislaya Guba, Russia.

- Tidal stream systems make use of the kinetic energy of moving water to power turbines. This technology simply relies on individual turbines which are placed in the water column; moored to be suspended, floating or anchored to the ocean floor. As the tide flows in or out, electrical energy is produced as water moves through the turbines.



Wave Power: Ocean surface waves are also a considerable source of energy potential, but energy that is not as restricted in terms of location as tidal energy systems. Typically, wave energy is captured using buoys which generate mechanical energy as they oscillate vertically from wave motion.

- Terminator devices extend perpendicular to the direction of wave travel and capture or reflect the power of the wave. Water enters through a subsurface opening into a chamber with air trapped above it and wave action causes the captured water column to move up and down like a piston to force the air though an opening connected to a turbine.

- A point absorber is a floating structure with components that move relative to each other due to wave action (e.g., a floating buoy inside a fixed cylinder). The relative motion is used to drive electromechanical or hydraulic energy converters.

- Attenuators are long multi-segment floating structures oriented parallel to the direction of the waves. The differing heights of waves along the length of the device causes flexing where the segments connect, and this flexing is connected to hydraulic pumps or other converters.

- Overtopping devices have reservoirs that are filled by incoming waves to levels above the average surrounding ocean. The water is then released, and gravity causes it to fall back toward the ocean surface. The energy of the falling water is used to turn hydro turbines.

Ocean Thermal Energy Conversion (OTEC) is a process that can produce electricity by using the temperature difference between deep cold ocean water and warm tropical surface waters. OTEC plants pump large quantities of deep cold seawater and surface seawater to run a power cycle and produce electricity. OTEC is firm power (24/7), a clean energy source, environmentally sustainable and capable of providing massive levels of energy.

Q.3. (c) Write down the negative impacts of timber extraction from forests.

(2) fu

Ans. Wood used for engineering purposes like building houses, making furniture is called timber.

The major effects of timber extraction on forest and tribal people include:

- Poor logging results in a degraded forest.
- Floods may be intensified by cutting of trees or upstream watersheds.
- Loss of biodiversity.
- Climatic changes such as lower precipitation.
- New logging roads permit shifting cultivators to gain access to logged areas and fell the remaining trees.

• It results in forest fragmentation which promotes loss of biodiversity because some species of plants and animals require large continuous areas of similar habitat to survive.

- Exploitation of tribal people by the contractors.
- Soil erosion especially on slopes occurs extensively.
- Sedimentation of irrigation systems, floods may be intensified by cutting of trees on upstream.

• Scientific research documenting the impact of timber extraction indicate that it has resulted in fragmentation of the remaining forest, as well as decrease in biodiversity.

- Loss of non-timber products and loss of long-term forest productivity on the site affect the subsistence economy of the forest dwellers.

Q.4. (a) Explain genetic diversity, species diversity and ecosystem diversity.

(3) fu

Ans. "Biodiversity" is often defined as the variety of all forms of life, from genes to species, through to the broad scale of ecosystems

Biological diversity includes 3 hierarchical levels.

Genetic diversity: It refers to the variation of genes within a species. The genetic diversity enables a population to adapt to its environment and to respond to natural selection. The amount of genetic variation is the basis of speciation. Genetic diversity within a species often increases with environmental variability.

Species diversity: Species are distinct units of diversity each playing a specific role in the ecosystem. Species diversity refers to the variety of species within a region. In nature, both the number and kind of species, as well as the number of individuals per species vary, leading to greater diversity.

Community and ecosystem diversity: Diversity at the level of community and ecosystem exists along 3 levels. It could be within-community diversity (alpha diversity), between-communities diversity (beta diversity) or diversity of the habitats over the total landscape or geographical area (gamma diversity).

Q.4. (b) Write a short note on Green Fuel.

(3)

Ans. Green Fuel

- Green fuel is also known as bio fuel and is now being promoted as a substitute for the usual fossil fuels that are used to power our vehicles, generators etc.
- Bio fuel is a type of fuel that is made by distilling plant and animal materials and are said to be less polluting and environmentally friendlier than the popular fossil fuel.
- There are many types of green fuels that are now available and some of the popular ones are Ethanol and bio diesel.
- These fuels are made from plants and animals and there is a new source for green fuel that is currently being researched and that is algae.

E85 is the abbreviation that is used for a fuel blend that is made up of 85% denatured ethanol fuel and the remaining 15% is made of gasoline or any other hydrocarbon. Ethanol fuel is produced by using starch and sugar producing crops like corn and sugarcane. These crops are put through a fermenting process that produced ethanol.

TYPES OF GREEN FUEL

1. HYDROGEN: UNLIKE fossil fuels, hydrogen is in abundance. In fact, hydrogen makes up 75% of the universe we live in, so there's no danger of it running out any time soon. There are many advantages to running a hydrogen-powered car

2. BIODIESEL: BIODESEL is a clean-burning renewable fuel made using a chemical process that converts natural vegetable oils and fats into a non-toxic and renewable form of energy. It is used as a replacement for standard diesel, but it can also be blended with diesel fuel in any proportion. Green diesel and biodiesel are some of many other forms of liquid biofuels that may be produced from vegetable or animal fats. All are mainly used for vehicle locomotion as they burn cleanly, are easily portable and contain high amounts of energy, thus making them compatible with combustion engines.

3. Liquefied Petroleum Gas (LPG): LPG is cleaner, cheaper and greener than regular fuel

4. Compressed Natural Gas (CNG): COMPRESSED natural gas (CNG) is a low-carbon fuel that can be used as an alternative to petrol or diesel. It's made from the same type of gas that is used for heating and cooking in the home. CNG burns far cleaner than conventional fuels and there is no shortage of the gas across the world.

5. ETHANOL: ETHANOL is an alternative to petrol and can be combined with regular unleaded fuel in any concentration, up to 100% pure ethanol. ETHANOL is made from fermentation of any sugar or starch from which alcohol may be made. It can also be produced from cellulosic combustion of bagasse and similarly inedible waste products or non-food energy crops.

Q.4. (c) Discuss conflicts/case studies over equitable sharing of river water:

(4)

Ans. The **sharing of waters** of the Cauvery river has been the source of a serious conflict between the two **states** of Tamil Nadu and Karnataka. The genesis of this

conflict rests in two agreements in 1892 and 1924 between the erstwhile Madras Presidency and Princely State of Mysore. The 802 kilometres (498 mi) Cauvery river has 44,000 km² basin area in Tamil Nadu and 32,000 km² basin area in Karnataka. The inflow from Karnataka is 425 TMC ft whereas that from Tamil Nadu is 252 TMCf. Tamil Nadu too had become heavily dependent on the river after they developed millions of agricultural land around the river. They argued that the livelihood of farmers would be affected if there was a change in the distribution of water.

The river dispute has attracted some of the most extreme protests and *dharnas*. In 1986, a farmer's association from Tanjavur, Tamil Nadu moved the Supreme Court (SC) and demanded that a tribunal be formed for the adjudication for the Cauvery water dispute. The next few years saw enough rain for the states to not create an uproar. In 1993, Tamil Nadu Chief Minister Jayalalithaa went on a sudden fast at the MG memorial in Chennai. She demanded Tamil Nadu's share of water as stipulated by the interim order.

In 1995, Karnataka received very little rainfall and hence could not obey the interim order. Tamil Nadu, on the other hand, approached the SC demanding release of 30 tmcft of water.

On 12 September, the SC ordered Karnataka to release 12,000 cusecs of water day to Tamil Nadu until 20 September. That means Karnataka will end up releasing more water to its neighbour.

FIRST TERM EXAMINATION [FEB. 2018] SECOND SEMESTER [B.TECH] ENVIRONMENTAL STUDIES [ETEH-114]

Time : 1.30 hrs.

M.M. : 30

Note: Q. No. 1 is compulsory. Attempt any two more Questions from the rest.

Q. 1. Attempt any five of the following:

(2)

Q. 1. (a) State the objectives of the environmental studies.

Ans. Objectives and Guiding Principles of Environmental Studies:

According to UNESCO (1971), the objectives of environmental studies are:

(a) Creating the awareness about environmental problems among people.

(b) Imparting basic knowledge about the environment and its allied problems.

(c) Developing an attitude of concern for the environment.

(d) Motivating public to participate in environment protection and environment improvement.

(e) Acquiring skills to help the concerned individuals in identifying and solving environmental problems.

(f) Striving to attain harmony with Nature.

Q. 1. (b) Write short note on ecological succession.

Ans. Refer Q. 2. (c) of End Term 2017.

(2)

Q. 1. (c) What are the hotspots of biodiversity?

(2)

A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction.

The term biodiversity hotspot specifically refers to 25 biologically rich areas around the world that have lost at least 70 percent of their original habitat.

The remaining natural habitat in these biodiversity hotspots amounts to just 1.4 percent of the land surface of the planet, yet supports nearly 60 percent of the world's plant, bird, mammal, reptile, and amphibian species.

List of Biodiversity Hotspots

- **North and Central America:** California Floristic Province, Madrean pine-oak woodlands, Mesoamerica
- **The Caribbean:** Caribbean Islands
- **South America:** Atlantic Forest, Cerrado, Chilean Winter Rainfall-Valdivian forests, Tumbes-Chocó-Magdalena, Tropical Andes
- **Europe:** Mediterranean Basin
- **Africa:** Cape Floristic Region, Coastal Forests of Eastern Africa, Eastern montane, Guinean Forests of West Africa; Horn of Africa; Madagascar and the Indian Ocean Islands; Maputaland-Pondoland-Albany; Succulent Karoo
- **Central Asia:** Mountains of Central Asia;
- **South Asia:** Eastern Himalaya, Nepal; Indo-Burma, India and Myanmar; Western Ghats, India; Sri Lanka
- **South East Asia and Asia-Pacific:** East Melanesian Islands; New Caledonia; New Zealand; Philippines; Polynesia-Micronesia; Southwest Australia; Sundaland; Wallacea;

- **East Asia:** Japan; Mountains of Southwest China
- **West Asia:** Caucasus; Irano-Anatolian

Q.1. (d) What are the consequences of drought?

Ans. Consequences of drought:

- In times of drought, the lack of water can often cause a decline in crop yields, and thus a reduction in income for farmers
- Drought can result in insect infestations and plant diseases,
- Increased erosion, habitat and landscape degradation
- Decrease in air quality and that of what water is present, as well as an increased risk of fire because of drier vegetation.
- Plant and animal species can suffer tremendously, and over time desertification can happen with an extreme lack of moisture.
- Droughts have social impacts that can cause disputes between users of available water, inequalities in water distribution between wealthy and poor, disparities in areas in need of disaster relief, and a decline in health.

Q.1.(e) Discuss the importance of forest.

Ans. Importance of forests

Atmospheric regulation:

- Absorption of solar heat during evapo-transpiration
- Maintaining carbon dioxide levels for plant growth
- Maintaining the local climatic conditions

Water shed production:

- Reducing the rate of surface run-off of water
- Preventing flash floods and soil erosion
- Producing prolonged gradual run off and thus safeguarding against drought

Erosion control: Holding soil by preventing rain from directly washing it away.

Land bank: Maintaining soil nutrients and structure

Local use (consumptive use):

- Food: gathering plants, fishing, hunting from the forest
- Fodder for cattle
- Fuel wood and charcoal for cooking and heating
- Poles for building homes especially in rural and wilderness areas
- Timber for household articles and construction
- Fiber for weaving baskets, ropes, nets, string etc.
- Sericulture for silk
- Apiculture or rearing bees for honey
- Medicinal plants for traditional medicines

Market use (Productive use)

- Most of the above forest products are sold as a source of income for supporting the livelihoods of forest-dwelling people
- Minor forest produce like fuel wood, fruit, gum, fiber etc., which are collected and sold in local markets as a source of income for forest dwellers
- Major timber extraction for construction, industrial uses, paper pulp etc.

Q.1.(f) Discuss the ocean thermal energy. (2)

Ans. Refer Q. 5. (b) of End Term Examination 2018.

Q.2. (a) "The need for public awareness about environment is of vital importance." Discuss. (3)

Ans. If we have to improve the **environment**, public awareness is the primary requirement. There are a number of ways in which we can spread awareness and educate the public how to protect the environment.

- i. Running awareness campaigns
- ii. Providing environmental education at the school level
- iii. Regulating environmental legal rights and responsibilities
- iv. Spreading awareness via the media
- v. Encouraging public participation

Today, these initiatives are being undertaken by the government, the media, as well as by schools at a considerable level. The government plays an important role in creating public awareness. The 'Environmental Education, Awareness and Training' programme of the Government of India aims at developing public knowledge and skills to protect the environment.

Q. 2. (b) Explain ecological pyramid. Discuss the nutrients and energy flow in an ecosystem. (4)

Ans. Ecological pyramid:

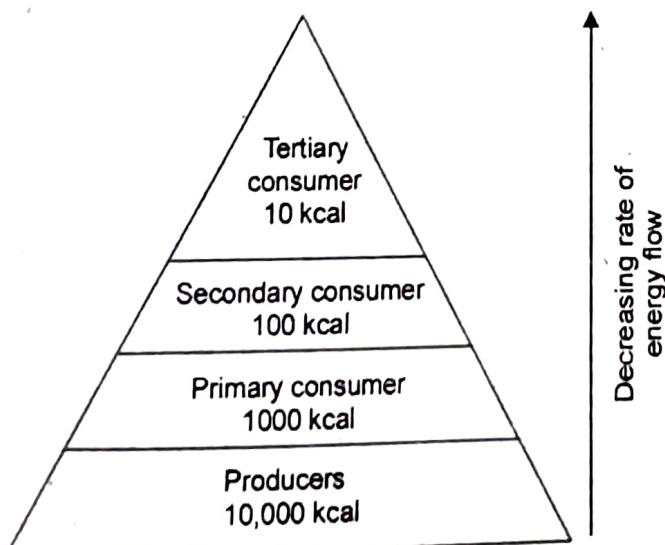
There are 3 types of ecological pyramids as described as follows:

- Pyramid of energy • Pyramid of numbers • Pyramid of biomass.

Pyramid of Energy:

The pyramid of energy or the energy pyramid describes the overall nature of the ecosystem. During the flow of energy from organism to other, there is considerable loss of energy in the form of heat. The primary producers like the autotrophs there is more amount of energy available. The least energy is available in the tertiary consumers. Thus, shorter food chain has more amount of energy available even at the highest trophic level.

- The energy pyramid always upright and vertical.
- This pyramid shows the flow of energy at different trophic levels.
- It depicts the energy is minimum as the highest trophic level and is maximum at the lowest trophic level.
- At each trophic level, there is successive loss of energy in the form of heat and respiration, etc.



Pyramid of Energy

Pyramid of Numbers: The pyramid of numbers depicts the relationship in terms of the number of producers, herbivores and the carnivores at their successive trophic levels. There is a decrease in the number of individuals from the lower to the higher trophic levels. The number pyramid varies from ecosystem to ecosystem. There are three types of pyramid of numbers:

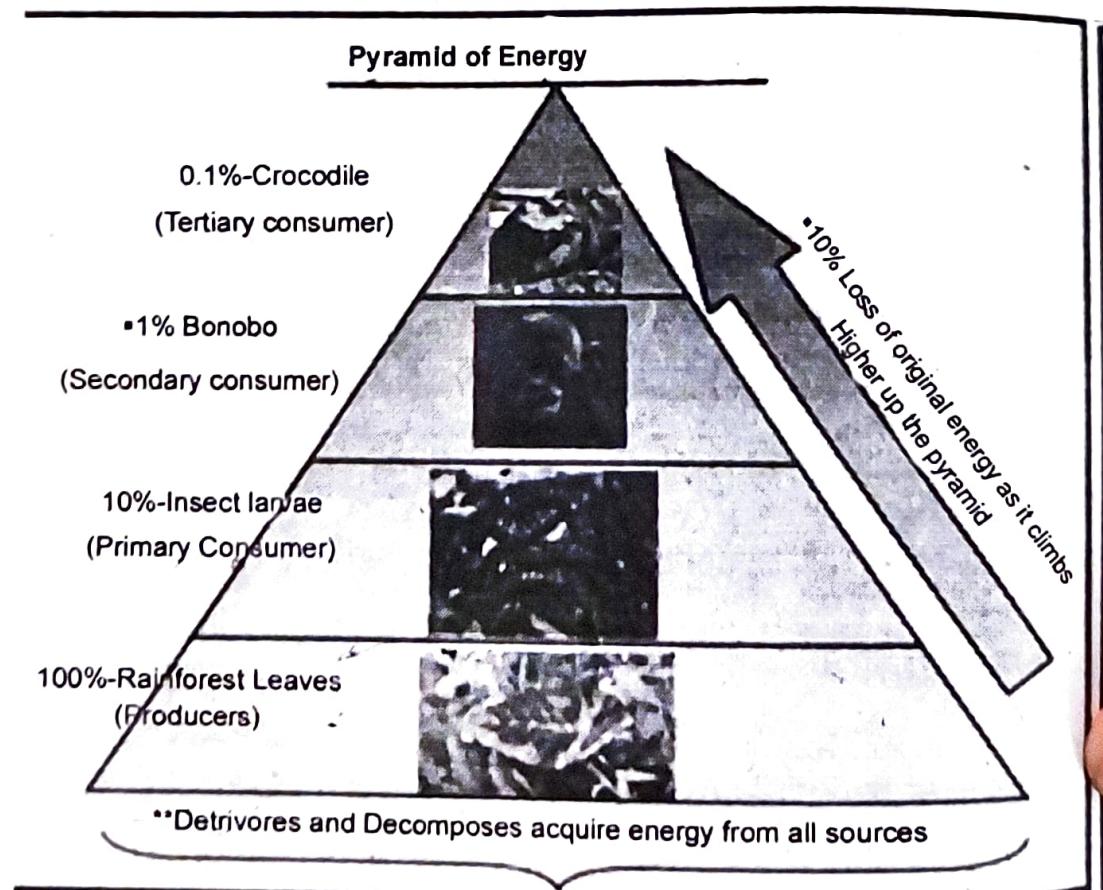
- Upright pyramid of number
- Partly upright pyramid of number and
- Inverted pyramid of number.

Pyramid of Biomass: The pyramid of biomass is more fundamental, they represent the quantitative relationships of the standing crops. In this pyramid there is a gradual decrease in the biomass from the producers to the higher trophic levels. The biomass here the net organisms collected from each feeding level and are then dried and weighed. This dry weight is the biomass and it represents the amount of energy available in the form of organic matter of the organisms. In this pyramid the net dry weight is plotted to that of the producers, herbivores, carnivores, etc.

There are two types of pyramid of biomass, they are:

- Upright pyramid of biomass and
- Inverted pyramid of biomass.

ENERGY FLOW IN ECOSYSTEM



1. The energy starts with the sun
2. Plants produce metabolic energy via photosynthesis, wherein approximately 10% of their energy is stored in their tissues, available for consumption by a grazing herbivore. The rest of the solar energy was used by the plant in its own metabolism, lost as heat or lost as waste.

3. Of that 10% that an herbivore eats, only 10% of that is stored in its tissues to be eaten by a carnivore. Just like the plant, the other 90% of its metabolic energy is used up by the herbivore in functioning, excreting waste, and heat loss.
4. This continues up the pyramid with each subsequent carnivore only inheriting 10% of the previous level's energy.
5. By the time that the original solar energy hits the top of the pyramid, as little as 0.1% of the energy is consumed by the top predator; the rest is lost to metabolic activities.
6. Decomposers, such as bacteria, worms, and fungi, obtain the little amount of energy remaining in the tissues of dead plants and animals.

Nutrient Flow of Ecosystem

Organisms that need to consume other organisms to obtain their energy are called **consumers** or **heterotrophs**. Animals, humans, fungi and bacteria are all consumers. They obtain their nutrients and energy by eating other organisms.

There are different types of consumers. There are primary consumers, known as **herbivores** that eat plants and are often eaten by other animals and there are secondary consumers, or **carnivores** that eat the herbivores. The consumers that are able to eat both plants and animals are known as **omnivores** while animals that eat only dead animals are called **scavengers**. Bacteria and fungi that return nutrients to the soil when they decompose dead animals and plants are called **decomposers**. The interaction between producers and primary and secondary and possibly tertiary consumers keeps an ecosystem healthy.

Q. 2. (c) Discuss the various approaches for conservation of biodiversity. (3)

Ans. There are two basic approaches towards conservation of bio diversity:

1. In situ conservation
2. Ex situ conservation

(1) In situ conservation: In-situ approaches include methods and tools that protect species, genetic varieties and habitats in the wild. It is a favourable approach amongst ecologists and conservationists to protect habitats and ecosystems.

(a) Biosphere reserves: Out of 425 biosphere reserves in the world, 14 are in India. Hot spots are the areas / regions of high endemism and very high levels of species richness. There are 34 hot spots in the world, of which three are in India; namely Western Ghats and Sri Lanka, Indo-Burma and Himalaya.

(b) National parks and wildlife sanctuaries: India has 90 national parks and 448 wildlife sanctuaries.

Sacred groves: These are forest patches which were venerated and given total protection. It includes a number of rare, endangered and endemic species. Ex. Western Ghats, Khasi and Jaintia Hills in Meghalaya

(2) Ex situ conservation: Ex-situ approaches include methods that remove plants, animals and microbial species and genetic varieties from their environment. These are popular amongst agriculturalists and species-orientated biologists, and helps the maintenance of samples of species.

India has 35 botanical gardens and 275 zoological parks. By using Cryopreservation (-1960 C) technique, sperms, eggs, animal cells, tissues and embryos can be stored for long period. Plants are propagated by using tissue culture methods called micropropagation.

Q. 3. (a) Discuss the consequences of over-exploitation of mineral resources. (3)

(a) Mining is hazardous occupation:

1. This occupation involves several health risk dust produced during mining operation are injurious to health and cause lung diseases.

2. Extraction of some toxic or radioactive minerals leads to life threatening hazards.
3. Dynamite explosion during mining is very risky as fumes produced are extremely poisonous.

4. Underground mining is more hazardous than surface mining as there are more chances if accidents like roof falls, flooding and inadequate ventilation etc.

Increasing demand for high grade minerals has compelled miners to carry out more extraction of minerals, which require more energy sources and produce large amount of waste materials.

(b) Wastage of upper soil layer and vegetation:

Surface mining results in the complete destruction of upper soil layer and vegetation. After extraction, the wastes are dumped in an area which destroys the total surface and vegetation.

(c) Environmental problems:

Over exploitation of mineral resources resulted in many environmental problems like:

1. Conversion of productive land into mining and industrial areas.
2. Mining and extraction process are one of the sources of air, water and land pollution.
3. Mining involves huge consumption of energy resources like coal, petroleum, natural gas etc. which are in-turn non renewable sources of energy.
4. Surface mining directly degrades the fertile soil surface thus effect ecology and climate if that particular area.

Increasing demand for high grade minerals has compelled miners to carry out more extraction of minerals, which require more energy sources and produce large amount of waste materials.

(d) Wastage of upper soil layer and vegetation:

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Over exploitation of mineral resources resulted in many environmental problems like:

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4. Surface mining directly degrades the fertile soil surface thus effect ecology and climate if that particular area.

Q.3. (b) What are the negative impacts of modern agriculture on environment? (3)

Ans. Refer Q. 4. (a) of End Term Examination 2017.

Q. 3. (c) Write short notes on:- (2)

(i) Shifting cultivation

Ans. Shifting cultivation that means the shifting of the land from the other place for the cultivation purpose. In that there is the there is the change of the place is take

place that means if there is the cultivation of the land is get reduced then by shifting it we can increase this.

In the different region of the country there is the one and unique features of the shifting of the land in the India. In the purpose of the minor and major variation these have featured in the two distinct patterns that are the (i) settled farming on the permanent and developed land in the plains and valley areas and (ii) tribal agricultural practices.

The shifting of the cultivation is also known as its famous word that is 'Jhumming', that name is give because the cultivation land can be on the slopes of the hills or it is called as the Jhum that is available in the area of the hills. This region is used by the peoples of the India that are in the region of the hills.

That is being used in the region of the hill areas of that is the North-Eastern Region, Sikkim, Bihar, Orissa, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, Kerala, Karnataka and Maharashtra.

Advantages of Shifting Cultivation:

- The best advantage of the shifting of the cultivation or the land on the hills side that is to provide the very easy and very fast method of the preparation of the land for the agriculture.
- The waste material of the field that is the bush and the weeds can be removed easily and that can be burn easily and can be obtaining the beneficial things for the cultivation
- In this shifting cultivation the growth of the crops will start fast and in the sometimes only it will get ready for the harvest.
- In this shifting of the cultivation there is no any fear or the danger for the flood and the animals which destroy the crops. On the hills there are the streams of the mountain which provide the water to the crops easily on the regular and normal rate.

Disadvantage of Shifting Cultivation:

- The most and the important disadvantage of the shifting cultivation is that to cut the Forrest and the trees that are helpful for the soil erosion and that is very helpful for the nature.
- By this there can be the heavy erosion of the soil is get affected and by this the rivers that are in the plain and low laying areas like the Brahmaputra and Barak get flooded in the time of the heavy rain fall.
- By the shifting cultivation there is the loss of the 22 percent of the soil that is on the top of the soil and full with the fertility. This creates the serious problem in the economic rate of the peoples

Q.3.(c)(ii) Water logging and salinity

Ans. Salinisation is a process that results in an increased concentration of soluble salts in soil and water. Of these salts, sodium chloride, or table salt, is the most common. Salinity is the state of soils that have a high concentration of such salts. Primary salinisation is when salts accumulate in the soil and groundwater of an area over a long period of time due to natural processes.

Impacts of salinity

High soil salinity adversely affects plant growth of both native and introduced crop and pasture species. This is due to the toxicity of the salt ions, as well as the general osmotic effect of the soil around the roots of the plant, which reduces the ability of the plant to absorb water from the soil.

Increased salinity poses a significant threat to the health and wellbeing of many ecosystems, and to biodiversity as a whole. It can destroy remnant vegetation, leading to the disappearance of animal species that are dependent upon this vegetation for habitat.

High salinity not only makes the soil chemically toxic for plants, but it also affects the soil's physical properties.

Saline soils are also prone to erosion as a result of the death of vegetation that would otherwise have stabilised them.

Water logging

The waterlogging may be defined as rendering the soil unproductive and infertile due to excessive moisture and creation of anaerobic conditions.

Causes of water logging: They are as follows

- (i) Inadequate drainage of over-land run-off increases the rate of percolation and in turn helps in raising the water table.
- (ii) The water from rivers may infiltrate into the soil.
- (iii) Seepage of water from earthen canals also adds significant quantity of water to the underground reservoir continuously.
- (iv) Sometimes subsoil does not permit free flow of subsoil water which may accentuate the process of raising the water table.

Adverse Effect of Water Logging

1. Depletion of oxygen in root zone and increase of CO₂ due to water logging. An aerobic condition adversely affects micro-organisms while harmful organisms proliferate and restrict the plant growth.

2. Physical or chemical and biological activities in the soil are disturbed due to low temp as a result of water logging. Thus pest and diseases infestation problem arises.

3. Water logging makes field operations difficult or impossible.

4. The adverse effects of water logging get accelerated when the capillary water brings salts from lower horizon of soil or they are present in the ground water used for irrigation.

5. Water logging adversely affect the soil water plant relationship thereby creating ecological imbalance.

6. Secondary salinization caused by the salts which are brought up from lower horizon restrict the uptake of moisture and nutrients in the plant roots and create toxic effect in the root system.

7. Due to excess soluble salts the physical condition of soil deteriorates. Highly deteriorated alkali soils have very low infiltration rates. Most rainfall goes as runoff, causing crop damages in adjoining area.

8. Crops yields reduced and sometimes crop failure due to inadequate uptake of moisture and nutrients and due to the injurious effect of salts or deteriorated soil condition.

9. Fodders grown in salt-affected soils may contain high molybdenum or selenium and low amount of zinc. The nutritional imbalance may cause disease in live stock.

Q. 4. (a) What are major causes and consequences of deforestation? (4)

Ans. Causes of Deforestation

1. Agricultural Activities: Due to overgrowing demand for food products, huge amount of trees are fell down to grow crops and for cattle grazing.

2. Logging: Apart from this, wood based industries like paper, match-sticks, furniture etc also need a substantial amount of wood supply. Wood is used as fuel both

directly and indirectly, therefore trees are chopped for supplies. Firewood and charcoal are examples of wood being used as fuel. Some of these industries thrive on illegal wood cutting and felling of trees.

3. Urbanization: Further on order to gain access to these forests, the construction of roads are undertaken; here again trees are chopped to create roads. Overpopulation too directly affects forest covers, as with the expansion of cities more land is needed to establish housing and settlements. Therefore forest land is reclaimed.

4. Desertification of land: Some of the other factors that lead to deforestation are also part natural and part anthropogenic like Desertification of land. It occurs due to land abuse making it unfit for growth of trees.

5. Mining: Oil and coal mining require considerable amount of forest land. Apart from this, roads and highways have to be built to make way for trucks and other equipment. The waste that comes out from mining pollutes the environment and affects the nearby species.

6. Forest Fires: Hundreds of trees are lost each year due to forest fires in various portions of the world. This happens due to extreme warm summers and milder winters. Fires, whether causes by man or nature results in huge loss of forest cover.

Consequences of Deforestation:

1. Food problems: The soil in many deforested areas is also unsuitable for supporting annual crops.

2. Exposing soil to heat and rain: Heavy rainfall and high sunlight quickly damage the topsoil in clearings of the tropical rain forests.

3. Flooding: Deforestation can result to watersheds that are no longer able to sustain and regulate water flows from rivers to streams. Trees are highly effective in absorbing water quantities, keeping the amount of water in watersheds to a manageable level.

4. Displacement of indigenous communities: Some indigenous people's way of life and survival are threatened by the loss of forests. Fewer trees result in a secure future for forest workers.

5. Climate change: Deforestation can cause the climate to become extreme in nature. It increases CO₂ concentration in atmosphere and contributes to global warming.

7. Economic loss: The occurrence and strength of floods and droughts affecting the economy. It also leads to loss of future markets for ecotourism.

8. Health issues: The stress of environmental change may make some species more susceptible to the effect of insects, pollution and disease.

Q. 4. (b) Discuss the consumptive and productive values of biodiversity.

Ans. The direct values are of two types (1) Consumptive use value and (2) Productive use value.

1. Consumptive use value: These are the direct use values where the biodiversity products can be harvested and consumed directly. Example: Food, fuel and drugs. These goods are consumed locally and do not figure in national and international market.

(a) Food:

(i) **Plants:** The most fundamental value of biological resources particularly plants is providing food. Basically three crops i.e. wheat, maize and rice constitute more than two thirds of the food requirement all over the world.

(ii) **Fish:** Through the development of aquaculture, techniques, fish and fish products have become the largest source of protein in the world.

(b) **Fuel:** Since ages forests have provided wood which is used as a fuel. Moreover fossil fuels like coal, petroleum, natural gas are also products of biodiversity which are directly consumed by humans.

(c) **Drugs and medicines:** The traditional medical practice like ayurveda utilizes

plants or their extracts directly. In allopathy, the pharmaceutical industry is much more dependent on natural products. Many drugs are derived from plants like cinchona tree.

- (i) Quinine: The famous anti malaria drug is obtained from cinchona tree.
- (ii) Penicillin: A famous antibiotic is derived from penicillium, a fungus.
- (iii) Tetracycline: It is obtained from bacterium.

2 Productive use Values:

These are the commercially usable values where the product is marketed and sold. It may include number of wild gene resources that can be traded for use by scientists for introducing desirable traits in the crops and domesticated animals.

These may include the animal products like tusks of elephants, musk from musk deer, silk from silkworm, wool from sheep, fur of many animals, lac from lac insects etc, all of which are traded in the market. Many industries are dependent upon the productive use values of biodiversity e.g. the paper industry, plywood industry, railway sleeper industry, silk industry, textile industry, ivory-works, leather industry, pearl industry etc.

Q. 4. (c) How are poaching and human wildlife conflicts responsible for depletion of biodiversity?

Ans. Poaching of wildlife for trade and commercial activities has been on the rise for the last many decades. It has been a significant cause of the extinction of hundreds of species and the endangerment of many more, such as whales and many African large mammal, Asian tigers, etc. Most extinction over the past several hundred years is mainly due to overharvesting for food, fashion, and profit.

Illicit trade in wildlife in current times is driving many species of wild animals and plants to extinction. Elephants are poached for ivory; tigers and leopards for their skin; pangolins for meat and scales; and rare timber is targeted for hardwood furniture.

How does poaching affect the environment?

~ Poaching or illegal hunting causes animals endangered of being extinct. If more animals becomes extinct there's a disruption in the food chain, and that will cause major problems in our ecosystem, resulting eventually in new adaptations of animals, and/or species beyond human control.

~ Poaching results in animals being hunted too soon for them to have time to reproduce and repopulate.

Man-wildlife conflict refers to the interaction between wild animals and people and the consequential negative impact on both of them. Human population growth and the resultant destruction of wildlife habitat for human habitation and economic prosperity create reduction of resources or life to some people and wild animals. Since human populations expand into wild animal habitats, natural wildlife territory is displaced. Reduction in the availability of natural prey/food sources leads to wild animals seeking alternate sources. Alternately, new resources created by humans draw wildlife resulting in conflict. Competition for food resources also occurs when humans attempt to harvest natural resources such as fish and grassland pasture.

There are many consequences of man versus wildlife conflicts. The major consequences are

- Destruction of wildlife habitat
- Injury and loss of life of both humans and wildlife
- Crop damage and livestock depredation
- Damage to human property
- Decrease in wildlife population and reduction in geographic ranges
- Trophic cascades

Apart from the above, there are other causes of threat to biodiversity. Factors such as climate change, invasion of non-native species also add to biodiversity losses in some or the other.

FIRST TERM EXAMINATION [FEB. 2019]

SECOND SEMESTER [B.TECH]

ENVIRONMENTAL STUDIES [ETEN-114]

M.M. : 30

Time : 1½ hrs.

Note :- Attempt Q.no. 1 which is compulsory and any two more questions from the remaining.

Q.1. Write short notes on: (2.5)

Q.1. (a) Enumerate the reasons of land degradation and its implications.

Ans. Causes of land degradation:

- Mining sites are abandoned after the excavation work is done, leaving deep scars of overburdening. In states like Odisha, Jharkhand, Madhya Pradesh, Chhattisgarh, deforestation due to mining has caused severe land degradation.
- Overgrazing in states like Gujarat, Rajasthan, Madhya Pradesh, and Maharashtra is one of the main reasons behind land degradation.
- Overirrigation and waterlogging lead to increase in salinity and alkalinity in the states of Punjab, Haryana and western Uttar Pradesh, thereby leading to land degradation.
- Mineral processing like grinding of limestone for cement industry and calcite and soapstone for ceramic industry generate huge quantities of dust in the atmosphere. It stops the infiltration of water in the soil.
- Industrial effluents as wastes have become a major source of land and water pollution in many parts of the country.

Ways to check land degradation:

- Afforestation and proper management of grazing can help to check land degradation.
- Planting of shelter belts help in checking the sand causing land degradation near the deserts.
- Overgrazing can be checked and avoided.
- Stabilisation of sand dunes by growing thorny bushes can also check land degradation.
- Proper management of waste land can be taken up.
- Control on mining activities, so that mining does not affect the land and by refilling the scars.
- Proper discharge and disposal of industrial effluents and wastes after treatment can reduce land and water degradation in industrial areas.

Q.1.(b) Describe the nutrition related global health problems. (2.5)

Ans. Nutrition related world health problems

Obesity: The imbalance between declining energy expenditure due to physical inactivity and high energy in the diet (excess calories whether from sugar, starches or fat) is the main determinant of the obesity epidemic.

Diabetes: Excess weight gain, overweight and obesity and physical inactivity account for the escalating rates of type 2 diabetes, worldwide. Diabetes leads to increased risk of heart disease, kidney disease, stroke and infections.

Cardiovascular diseases: Cardiovascular diseases, the major killers worldwide, are to a great extent due to unbalanced diets and physical inactivity. Risk of their main forms, heart disease and stroke, is reduced by eating less saturated and trans fats.

Cancer: Tobacco is the number one cause of cancer, but dietary factors contribute significantly to some types of cancer. Maintaining a healthy weight will reduce the risk for cancers of the oesophagus, colorectum, breast, endometrium and kidney.

Osteoporosis and bone fractures: Fragility fractures are a problem of older people. Adequate intakes of calcium (500 mg per day or more) and of vitamin D in populations with high osteoporosis rates helps to reduce fracture risk, so does sun exposure and physical activity to strengthen bones and muscles.

Dental disease: Caries is preventable by limiting the frequency and amount of consumption of sugars and by appropriate exposure to fluoride. Erosion of teeth by dietary acids in beverages or other acidic foods may contribute to tooth destruction.

PEM: It is an important nutritional problem among pre-school children. It leads to various degrees of growth retardation. This is due to lack of adequate quantity of protein or carbohydrate or both.

PEM is of 2 types: Kwashiorkor and Marasmus.

Deficient Nutrient	Name of Deficiency	Deficiency Symptoms
Protein (PEM)	Kwashiorkor (usually observed in children in the age group of 1-5 years)	Wastes muscles, thin limbs, retarded growth of body and brain, swelling of legs due to retention of water (oedema), reddish hair, pot belly and diarrhoea
Protein and Calorie (PEM)	Marasmus (it usually affects infants below age of one year).	Impaired growth and replacement of tissue proteins, thin limb and prominent ribs (very less fat in the body), dry, wrinkled and thin skin, diarrhoea.

The child suffering from PEM can recover if adequate quantities of protein and carbohydrate rich food are given.

(ii) **Night blindness and Xerophthalmia:** These diseases are due to deficiency of vitamin A.

(iii) **Anaemia:** This disease is caused by deficiency of iron.

(iv) **Goitre:** Goitre is caused due to deficiency of iodine in food.

Q.1. (c) How is climate change a possible threat to the biodiversity? (2.5)

Ans. Climate change Threats to biodiversity

Temperature Spikes: A number of species will be affected physiologically by climate change. There is evidence that some species are physiologically vulnerable to temperature spikes. For example, the green ringtail possum, an endemic species of Queensland's tropical rainforests, cannot control its body temperature when the ambient temperature rises above 30°C.

Coral bleaching

Warmer sea surface temperatures are blamed for an increase in a phenomenon called coral bleaching. Zooxanthellae are expelled when the coral is under stress from environmental factors such as abnormally high water temperatures and/or pollution.

Ocean acidification poses yet another challenge for corals because it makes it harder for corals to build their skeletons.

Increases in Extreme Events: Predicted changes in the intensity, frequency and extent of disturbances such as fire, cyclone, drought and flood will place existing vegetation under stress and favour species able to rapidly colonise denuded areas. Extended periods of warmer sea temperatures resulted in the shut-down of the abalone industry, and the migration of whale sharks and manta rays further south and east than usual.

Changes in Rainfall: Predicted decreased rainfall and consequent lower river flows in regions would have a major impact on aquatic biota. Even minor changes in rainfall patterns could have major impacts on wildlife.

Increased CO₂ and Plant Growth: Increased carbon dioxide in the atmosphere causes increased growth rates in many plant species. A lot of CO₂ that has been emitted into the atmosphere has been absorbed by the oceans. This has resulted in a decrease in the ocean's pH, which in turn affects the rate at which many marine organisms build skeletons.

Sea-Level Rise: Sea level is predicted to rise by 26–98 centimeters by 2100, due to the thermal expansion of the oceans and the melting of polar ice-caps and ice sheets. Increase in sea level could threaten many coastal ecosystems. Also at risk are mangrove forests and low-lying freshwater wetlands in Kakadu National Park.

Q.1. (d) How do we apply engineering aspects to environmental studies? Explain with example. (2.5)

Ans. • Mechanical engineering courses oriented towards designing machines and mechanical systems for environmental use such as water and wastewater treatment facilities, pumping stations, garbage segregation plants, and other mechanical facilities.

- Environmental engineering or environmental systems courses oriented towards a civil engineering approach in which structures and the landscape are constructed to blend with or protect the environment.

- Environmental chemistry, sustainable chemistry or environmental chemical engineering courses oriented towards understanding the effects of chemicals in the environment, including any mining processes, pollutants, and also biochemical processes.

- Environmental technology courses oriented towards producing electronic or electrical graduates capable of developing devices and artifacts able to monitor, measure, model and control environmental impact, including monitoring and managing energy generation from renewable sources.

Q.2. (a) Equitable sharing of water resources has become a bone of contention both nationally and internationally. Give arguments in favour of the statement with suitable case study. (5)

Ans. The Ganges Treaty between India and Bangladesh is an agreement to share surface waters at the Farakka Barrage near their mutual border. But the treaty, which was signed in 1996, divides water flow without sharing the value and uses of the river between the two countries. It does not create a community of interest in the shared management of the river and has left Bangladesh with numerous concerns and unresolved issues.

The main course of the Ganges River once ran through what is now known as the Hooghly River in India, but in the early 1500s shifted eastward toward the Bengal Delta in Bangladesh. Nonetheless, under the British Raj a port was established at the mouth of the Hooghly in Kolkata to transport goods to and from inland areas. India wanted to maintain the port, and in 1962 constructed a 2.25km long diversion, the Farakka Barrage, to redirect the Ganges's flow into the moribund Hooghly during the dry season – thus sparing the Kolkata port from being obsolete, but at the cost of adverse downstream effects on the Ganges in Bangladesh.

The dry season discharge of the Ganges at Farakka has declined due to increased upstream uses for agriculture and other purposes, and this has led on several occasions to Bangladesh not receiving the Treaty apportioned flow.

The Ganges Treaty ensures that: "The waters released to Bangladesh shall not be reduced below Farakka except for reasonable uses of waters, not exceeding 200 cusecs by India"

Q.2. (b) Modern agriculture has impacted our environment badly. Explain in detail the causes and possible solutions to the problem.

Ans. 1. Pesticides and Fertilizers: Modern-day pesticides and fertilizers have to deal with the local pests that have existed for hundreds of years along with the new invasive species. And so, they are laden with chemicals that are not found in nature.

2. Contaminated Water: Due to the disposal of industrial and agricultural waste in local bodies of water the crops are exposed to water, which has small amounts of mercury, arsenic, lead, and cadmium dissolved in it.

3. Soil Erosion and Sedimentation: Due to inefficient farming practices, this soil is left open for erosion and leads to declining fertility each year.

4. Pests and Weeds: Growing exotic crops and reducing the natural species in a certain area has become the norm for agriculture. As a result, the invasive species destroy the local vegetation and wildlife, altering the ecosystem permanently.

Solution to reduce impact of modern agriculture

- Don't use pesticides, veterinary medicines or chemicals unless there is an identified need.

- Don't allow the rainwater from poultry buildings that are ventilated to the roof to discharge directly to a watercourse.

- Don't directly overspray a watercourse when using pesticides.

- Don't hesitate to get involved in catchment partnerships to address diffuse agricultural pollution.

- Don't forget that over-abstraction of irrigation water from watercourses can cause downstream water pollution.

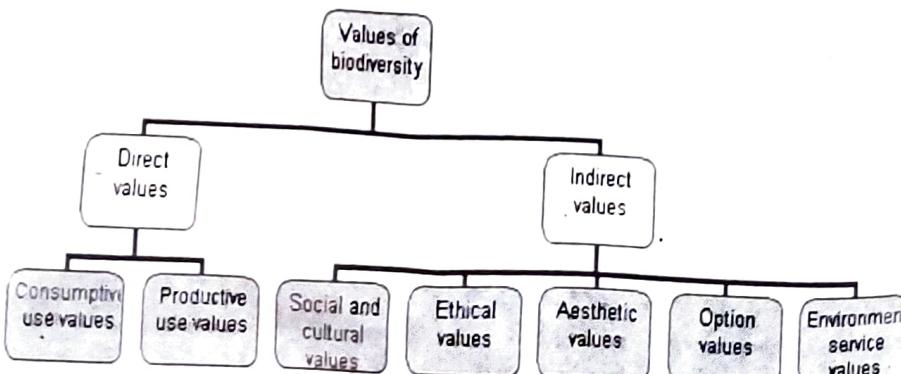
- **Adopting Nutrient Management Techniques:** Farmers can improve nutrient management practices by applying nutrients (fertilizer and manure) in the right amount, at the right time of year, with the right method and with the right placement.

- **Ensuring Year-Round Ground Cover:** Farmers can plant cover crops or perennial species to prevent periods of bare ground on farm fields when the soil (and the nutrients it contains) are most susceptible to erosion and loss into waterways.

- **Planting Field Buffers:** Farmers can plant trees, shrubs and grasses along the edges of fields; this is especially important for a field that borders water bodies.

Q.3. (a) Describe the direct and indirect values of biodiversity.

Ans.



Direct values: The direct value include food resources like grains, vegetables, fruits which are obtained from plant resources and meat, fish, egg, milk and milk products from animal resources. These also include other values like medicine, fuel, timber, fiber, wool, wax, resin, rubber, silk and decorative items.

The direct values are of two types (i) Consumptive use value and (ii) Productive use value.

(I) Consumptive use value: These are the direct use values where the biodiversity products can be harvested and consumed directly. Example: Food, fuel and drugs.

(a) Food:

(i) Plants: The most fundamental value of biological resources particularly plants is providing food. Basically three crops i.e. wheat, maize and rice constitute more than two third of the food requirement all over the world.

(ii) Fish: Through the development of aquaculture, techniques, fish and fish products have become the largest source of protein in the world.

(b) Fuel: Since ages forests have provided wood which is used as a fuel. Moreover fossil fuels like coal, petroleum, natural gas are also product of biodiversity which are directly consumed by humans.

(c) Drugs and medicines: The traditional medical practice like ayurveda utilizes plants or their extracts directly. In allopathy, the pharmaceutical industry is much more dependent on natural products.

(II) Productive use values: These are the direct use values where the product is commercially sold in national and international market. Many industries are dependent upon these values. Example- Textile, leather, silk, paper and pulp industry etc. Although there is an international ban on trade of products from endangered species like tusks of elephants, wool from sheep, fur of many animals etc. These are traded in market and fetch a booming business.

Indirect values: Biodiversity provides indirect benefits to human beings which support the existence of biological life and other benefits which are difficult to quantify. These include social and cultural values, ethical values, aesthetic values, option value and environment service values.

Social and cultural value: Many plants and animals are considered holy and sacred in India and are worshipped like Tulsi, peepal, cow, snake etc. In Indian society great cultural value is given to forest and as such tiger, peacock and lotus are named as the national animal, bird and flower respectively.

Ethical: These values are related to conservation of biodiversity where ethical issue of 'all life forms must be preserved' is laid down. There is an existence value which is attached to each species because biodiversity is valuable for the survival of human race.

Aesthetic value: There is a great aesthetic value which is attached to biodiversity. Natural landscapes at undisturbed places are a delight to watch and also provide opportunities for recreational activities like bird watching, photography etc. It promotes eco-tourism which further generates revenue by designing of zoological, botanical gardens, national parks, wild life conservation etc.

Q.3. (b) How has the environment suffered due to indiscriminate extraction of minerals.

Ans. Some of the major effects of mining on the environment are as follows:

1. It leads to the emission of dust, suspended particle and gases which cause air pollution.

2. Release of harmful trace element e.g., CO, Pb, Cd etc. leads to the contamination of surface water

3. Underground water is also contaminated due to seepage and infiltration of leached drainage.
4. Mining leads to the degradation of soil quality, fertility and makes it toxic.
5. Natural vegetation get adversely effected due to leached trace element.
6. The major consequences of mining is the deforestation.
7. It directly affect the ecosystem and its stability as many species are killed due to toxicity of water and soil and loss of habitat.
8. Mining results in wastage of land as it neither remain suitable for industrial use nor for agricultural purposes.
9. Mining directly results in the loss of landscape and beauty of surrounding.

Q.4. (a) Discuss the scope and limitations of wind as an alternate source of energy.

Ans. Wind Energy Potentials of India

- The National Institute of Wind Energy, formerly the Centre of Wind Energy

Technology, recently announced that the total onshore wind energy potential in the country is 302 GW (determined at a hub height of 100 meters).

• The fresh estimates are six-times the wind energy potential determined at a 50 meter hub height, and three-times the potential estimated at a hub height of 80 metres.

• Of the total estimated 302 GW potential, 153 GW is available in wasteland, 146 GW in cultivable land, and 3 GW in forest land.

• "The new Berkeley Lab study has found the total techno-economic wind potential to range from 2,006 GW for 80-meter hub heights (an indication of how high the wind turbine stands above the ground) to 3,121 GW for 120-meter hub heights".

• Only 25% of potential realisation gives us an opportunity as big as double the present total installed capacity. This shows the huge potentials in wind energy in India.

Limitation of Wind Energy

(1) Wind energy requires expensive storage during peak production time.

(2) It is unreliable energy source as winds are uncertain and unpredictable.

(3) There is visual and aesthetic impact on region.

(4) Requires large open areas for setting up wind farms.

(5) Noise pollution problem is usually associated with wind mills.

(6) Wind energy can be harnessed only in those areas where wind is strong enough and weather is windy for most parts of the year.

(7) Usually places, where wind power set-up is situated, are away from the places where demand of electricity is there. Transmission from such places increases cost of electricity.

(8) The average efficiency of wind turbine is very less as compared to fossil fuel power plants. We might require many wind turbines to produce similar impact.

(9) It can be a threat to wildlife. Birds do get killed or injured when they fly into turbines.

(10) Maintenance cost of wind turbines is high as they have mechanical parts which undergo wear and tear over the time.

Q.4. (b) Draw and describe three major types of ecological pyramids. (4)

Ans. Refer Q.2.(a) End Term Examination 2017. [Page No. 13-2017]

Q.4. (c) Discuss with example, the significance of ecological succession. (3)

Ans. Significance of ecological succession

1. The ecological succession includes the stages pioneer plants (lichens and mosses), grasses, shrubs, herbs and trees.
2. The animals begin to eat foods.
3. The fully functioning ecosystem reached to the climax community.
4. A mature community has greater diversity, larger organic structure, and balanced energy flows.
5. The principles lies in ecological succession are of the greatest importance to mankind.

Acadia National Park

Acadia National Park, in Maine, suffered a large wildfire in 1947 of over 10,000 acres. Being nearly 20% of the park's size, many were concerned that the park would be destroyed forever. Restoration efforts were left to nature however, and many think that the choice to not intervene paid off. While the first years were ugly, and only small plants could colonize the burnt soil, many years have led to a great amount of diversity in the tree species. While the trees before the fire were mostly evergreen trees, deciduous forests now dominate the landscape. This example shows how quickly secondary ecological succession can change a landscape.