ENVIORNMENTAL STUDIES (MAY 2018)

Answer any five questions from the following.

Q.1.A) What is meant by E-pollution? (3 M)

Ans:

- E-waste is a term used to cover almost all types of electrical and electronic equipment (EEE) that has or could enter the waste stream. It includes televisions, computers, mobile phones, fridges, washing machines, dryers, home entertainment and stereo systems, toys, toasters, kettles – almost any household or business item with circuitry or electrical components with power or battery supply.
- E-waste is now the fastest growing component of the municipal solid waste stream because people are upgrading their mobile phones, computers, televisions, audio equipment and printers more frequently than ever before. The problem is that much of these equipment's is ending up in landfills or overseas and is contaminating the environment.

Q.1.B) Explain concept of carbon credit. (3 M)

Ans:

- Carbon credit is a tradable permit scheme. It is a simple, non-compulsory way to counteract the greenhouse gases that contribute to climate change and global warming.
- Carbon credits create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air.
- A carbon credit represents one tonne of carbon dioxide either removed from the atmosphere or saved from being emitted.

1 credit = 1 tonne of CO_2

- Carbon credits are certificates awarded to countries that are successful in reducing emissions of greenhouse gases. Carbon credits are generated as the result of an additional carbon project.
- Carbon credits can be created in many ways but there are two broad types:

1. Sequestration (capturing or retaining carbon dioxide from the atmosphere) such as Afforestation and reforestation activities.
2. Carbon Dioxide Saving Projects such as use of renewable energies

The concept of carbon credits came into existence as a result of increasing awareness of the need for controlling emissions. Carbon credits were one of the outcomes of the Kyoto Protocol, an international agreement between 169 countries which created legally binding emission targets for developing nations.

Q.1.C) Explain the concept of ecological pyramid. (3 M)

Ans:

- An ecological pyramid is a graphical representation designed to show the number of organisms, energy relationships, and biomass of an ecosystem. They are also called Eltonian pyramids after Charles Elton, who developed the concept of ecological pyramids.
- The producers form the base and the carnivore occurs at the top of food chain. The different organisms in the pyramid are present in the sequence wise and include the producers at the base which are followed by the herbivore. These are followed by the primary carnivore at the top.
- They can be upright which means that the base is larger in size and it decreases as we move upwards. They can be inverted also which means that the base is smaller in size and it increases as we move upwards. It can be spindle shape which means that the base is thin along with the top but the middle part is broad.

The ecological pyramids are of three types:

- Pyramid of energy
- Pyramid of biomass and
- Pyramid of numbers.

Q.1.D) Differentiate between conventional and non-conventional energy (3 M)

Ans:

Conventional Energy	Non-Conventional Energy
Conventional energy is finite and hidden.	It is reliable and plentiful.
These will become more expensive as supplies dwindle and demand increase.	These will potentially be very cheap once technology and infrastructure improve.
These sources on burning produce greenhouse gases and other pollutants that effects human health and environment.	These are clean sources of energy. They produce neither greenhouse gases, which cause climate change nor polluting emissions.
These has low maintenance cost and require less land area for installations.	These has high maintenance cost and require large land area for installations.
There are many safety concerns surrounding these resources, such as explosion on oil platforms and collapsing coal mines.	There are as such no safety concerns with these resources.
These resources have high energy density.	These resources have less energy density.

Coal, petroleum, natural gases are the examples of conventional energy resources.	Solar energy, wind energy, tidal energy etc. are the examples of non-conventional energy sources.

Q.1.E) Explain food chain. (3 M)

Ans:

Food Chain:

- In an ecosystem energy flows from one trophic level to another. A trophic level represents a group of organisms, which are either predators or preys. All organisms in an ecosystem are linked to one another based on their nutritional needs. The relation between the individuals in a linear chain is a food chain.
- A food chain always begins with the producers. The various components of the food chain are a group of organisms. There is transfer of food energy through series of organisms by repeated eating and being eaten.
- A food chain shows how each organism gets food and how nutrients and energy are passed from one creature to the other. Food chains begin with plant-life, and end with animal-life. Some animals eat plants, some animals eat other animals.

Q.1.F) Explain causes and effects of ozone layer depletion. (3 M)

Ans:

Causes:

- The main things that lead to destruction of the ozone gas in the ozone layer. Low temperatures, increase in the level of chlorine and bromine gases in the upper stratosphere are some of the reasons that leads to ozone layer depletion. But the one and the most important reason for ozone layer depletion is the production and emission of chlorofluorocarbons (CFCs). This is what which leads to almost 80 percent of the total ozone layer depletion.
- There are many other substances that lead to ozone layer depletion such as hydro chlorofluorocarbons (HCFCs) and volatile organic compounds (VOCs). Such substances are found in vehicular emissions, by-products of industrial processes, aerosols and refrigerants. All these ozone depleting substances remain stable in the lower atmospheric region, but as they reach the stratosphere, they get exposed to the ultra violet rays. This leads to their breakdown and releasing of free chlorine atoms which reacts with the ozone gas, thus leading to the depletion of the ozone layer.

Effects:

- In humans, exposure to UV rays can also lead to difficulty in breathing, chest pain, and throat irritation and can even lead to hampering of lung function.
- UV rays affect other life forms too. It adversely affects the different species of amphibians and is one of the prime reasons for the declining numbers of the

amphibian species. It affects them in every stage of their life cycle; from hampering the growth and development in the larvae stage, deformities and decreases immunities in some species and to even retinal damage and blindness in some species.

- UV rays also have adverse effect on the marine ecosystem. It adversely affects the planktons which plays a vital role in the food chain and oceanic carbon cycle. Affecting phytoplankton will in turn affect the whole ocean ecosystem.
- UV rays will also affect the plants. UV radiations can alter the time of flowering in some plant species. It can also directly affect the plant growth by altering the physiological and developmental processes of the plants.

Q.1.G) Explain concept of Acid Rain. (3 M)

Ans:

- Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulphuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic.
- Acid rain results when sulphur dioxide (SO_2) and nitrogen oxides (NO_x) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_x react with water, oxygen and other chemicals to form sulphuric and nitric acids. These then mix with water and other materials before falling to the ground.
- While a small portion of the SO_2 and NO_x that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels.
- The major sources of SO_2 and NO_x in the atmosphere are:
    - Burning of fossil fuels to generate electricity. Two thirds of SO_2 and one fourth of NO_x in the atmosphere come from electric power generators.
    - Vehicles and heavy equipment.
    - Manufacturing, oil refineries and other industries.
- Winds can blow SO_2 and NO_x over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.

Q.2.a) Explain various modes needed for public awareness to protect earth from environmental degradation. (5 M)

Ans:

1. Public awareness of the environment comes from a result of general knowledge, specialist knowledge of a particular problem and a sense of responsibility for the environment.
2. As the Earth's resources are dwindling and our environment is being increasingly degraded by human activities, it is evident that something needs to be done. Human beings cannot isolate themselves from the environment.
3. Environmental protection and conservation is beyond the capacity of one individual, one institution or one government. Hence every citizen of the world needs to be aware and need to actively participate in protecting the global environment.
4. The various modes for public awareness to protect earth from environmental degradation are:

- Environmental education: Environmental education must be introduced as a course in schools and colleges.
- Mass media: Newspapers, magazines, television, radio programs can play an important role in educating masses.
- Seminars and conferences: Organizing seminars and conferences that may help to spread the environmental information to generate public awareness.
- Entertainment: Folk songs, street plays, documentaries can help propagate environmental awareness.
- Public supported movements: Events, marches, campaigns can be organised for an environmental cause.
- Science centres: Science centres can be established in villages and remote areas to spread information about the environmental problems, causes and control measures.
- Government and Non-Governmental Organisations: Government and NGOs can work together to carry out public awareness programs.

Q.2.B) Explain need and importance of Environmental studies? (5 M)

Ans:

Need:

- Public awareness of the environment comes from a result of general knowledge, specialist knowledge of a particular problem and a sense of responsibility for the environment.
- As the Earth's resources are dwindling and our environment is being increasingly degraded by human activities, it is evident that something needs to be done. Human beings cannot isolate themselves from the environment. The imbalance that they have created is slowly interfering with their survival and sustenance on Earth.

- Environmental pollution, growing human population, depletion of natural resources, climate changes, calamities and disasters are all environmental concerns. Environmental protection and conservation is beyond the capacity of one individual, one institution or one government.
- Hence every citizen of the world needs to be aware and need to actively participate in protecting the global environment.

Importance:

1. Environmental studies helps to understand the current environmental problems through the knowledge of physical, chemical, biological, and social processes. It provides the skills necessary to obtain solutions to environmental problems. It encourages the development and application of scientific principles to solve environmental problems.
2. Environmental studies helps to maintain ecological balance through basic operating knowledge of environmental systems and processes. It gives information regarding the changes in the environment due to anthropogenic factors. It helps gain skills to analyse the various environment systems and the effect of human activities on them.
3. Environmental studies helps to achieve sustainable development through the understanding of the relationships of development and environment. The concepts of environmental studies can be applied to study agriculture and design sustainable production systems.
4. Environmental studies applies economic methods, concepts of environmental policy analysis and environmental management. It helps to formulate the broad social, economic and regulatory frameworks in which environmental problems can be resolved. It includes property rights, cost-benefit analysis, economic instruments for pollution control etc.
5. Environmental studies aims to protect biodiversity. Growth in human population, increased material consumption, and technological development has increased rate and scale of environmental degradation leading to loss of biodiversity.
6. Environmental studies helps to educate people regarding their duties towards environmental protection. It provides basic information about the various environmental issues like energy needs, global climate change, toxic emissions, and waste disposal. It provides knowledge about development and utilisation of energy resources and importance of environmental stability in the contemporary culture.

Q.2.C) Explain the classification of ecosystem. (5 M)

Ans:

- An ecosystem is a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all of the non-living factors of the environment.
- According to British ecologist Arthur Tansley (1935), an ecosystem is a system that arises from the integration of all living and non-living factors of the environment.
- There are many examples of ecosystems – a pond, a forest, an estuary, a grassland.
- Early conceptions of an ecosystem were as a structured functional unit in equilibrium of energy and matter flows among constituent elements. Politically, the concept has become important, since the Convention on Biological Diversity in 1992, (CBD), signed by almost 200 nations.
- The CBD formulates the concept in the following definition: "Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit".
- An ecosystem may be natural (like forest, lake, ocean etc.) or man-made (such as an aquarium, a crop field etc.), temporary (like a rain fed pond) or permanent (like a lake, forest, etc.), aquatic (such as pond, ocean etc.) or terrestrial (like grassland, forest, etc.).
- Natural Ecosystem: Natural Ecosystem may be terrestrial (like desert, forest, etc.) or aquatic like pond, river, lake, etc. A natural ecosystem is a biological environment that is found in nature (e.g. a forest) rather than created or altered by man (e.g. a farm).
- Artificial Ecosystem: Humans have modified some ecosystems for their own benefits and these are Artificial Ecosystem. They can be terrestrial (crop field, garden etc.) or aquatic (aquarium, dam, manmade pond etc.).

Q.3.A) How electricity is generated by using wind energy? (5 M)

Ans:

- Wind is caused by the uneven heating of the atmosphere by the sun, variations in the earth's surface, and rotation of the earth. Mountains, bodies of water, and vegetation all influence wind flow patterns.
- Wind energy technologies use the energy in wind for practical purposes, such as generating electricity, charging batteries, pumping water, and grinding grain. Mechanical or electrical power is created through the kinetic energy of the wind. Wind power available is proportional to the cube of its speed, which means that the power available to a wind generator increases by a factor of eight if the wind speed doubles.
- Wind power is now the world's fastest growing energy source and the generation capacity has reached 435 GW at the end of 2015, around 7% of total global power generation capacity.
- Offshore wind has the potential to deliver substantial quantities of energy at a price that is cheaper than most of the other renewable energies, as wind speeds are generally higher offshore than on land.

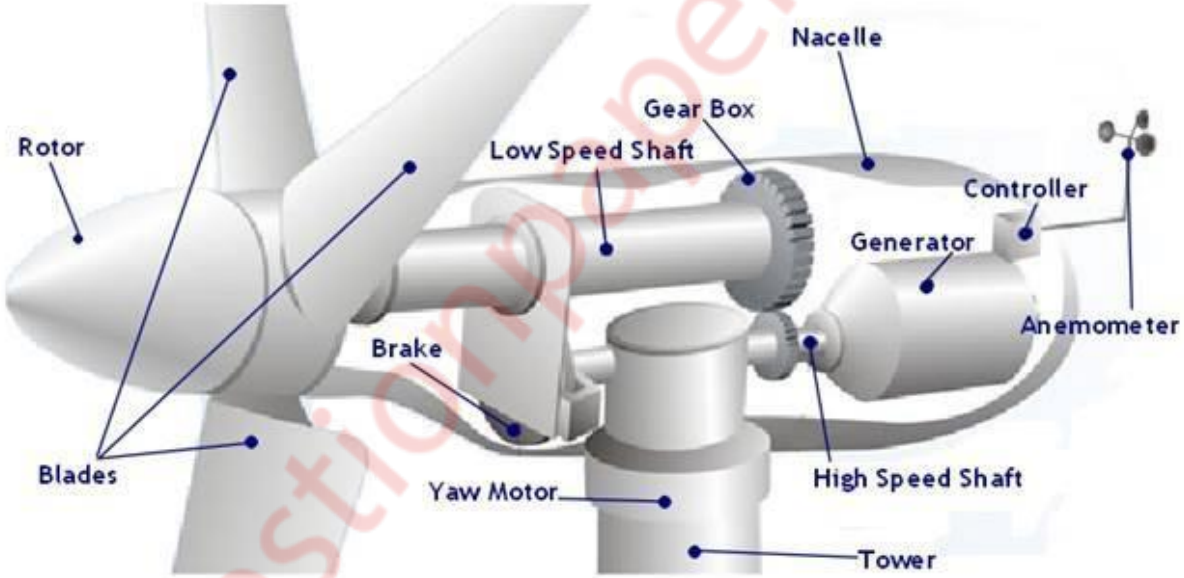
Principle:

Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical power into electricity. The mechanical power can also be utilized directly for specific tasks such as pumping water.

Construction and Working:

The basic components of the wind turbine include:

- a rotor, consists of the blades and the hub which convert the wind's energy into rotational shaft energy
- a nacelle containing a drive train, includes shafts, gearbox and generator
- pitch drive, turns the blades out of the wind to control rotor speed
- brake, slows the rotor down
- yaw drive, keeps the rotor and therefore the turbines facing the wind
- controller-anemometer, starts and stops the turbine from working depending on conditions
- a tower, to support the rotor and drive train; electronic equipment such as controls, electrical cables, ground support equipment, and interconnection equipment.



The schematic of the wind turbine components are shown here.

- When the wind blows a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. This is called lift.
- The force of the lift is actually much stronger than the wind’s force against the front side of the blade, which is called drag. The combination of lift and drag is what causes the rotor to spin.
- As the rotor spins, the low-speed shaft, which is connected to the gearbox, spins at the same rate.
- The gearbox takes this slow rotational speed and through correct gearing turns it into a faster rotational speed.
- The high-speed shaft, which is on the outgoing end of the gearbox and connected to a generator, spins at a higher rate of speed.

- The generator spins at this high rate of speed which spins magnets around a coil of metal wire and generates electricity.
- This electricity then travels down the tower to a transformer, where it is converted again to AC or DC voltage depending on the grid.

Q.3.B) State and explain principal, construction and working of flat plate collector used for solar energy. (5 M)

Ans:

The Earth receives an incredible supply of solar energy. The sun, an average star, is a fusion reactor that has been burning over 4 billion years. It provides enough energy in one minute to supply the world's energy needs for one year. The amount of solar radiation striking the earth over a three-day period is equivalent to the energy stored in all fossil energy sources. Global installed capacity for solar-powered electricity has seen an exponential growth, reaching around 227 GW at the end of 2015. It produced 1% of all electricity used globally. Solar energy is used in thermal and photovoltaic systems:

- **Thermal systems** concentrates sunlight, converts it into heat, and applies it to a steam generator or engine to be converted into electricity in order to warm buildings, heat water, generate electricity, or destroy dangerous waste. For example, solar thermal collectors.
- **Photovoltaic systems** are composed of cells made of semiconductor material, (silicon). It can produce power when sunlight strikes the semiconductor material and creates an electric current. For example, solar cells.

Flat Plate collectors (Solar thermal collectors):

- The flat-plate solar collectors are probably the most fundamental and most studied technology for solar-powered domestic hot water systems.

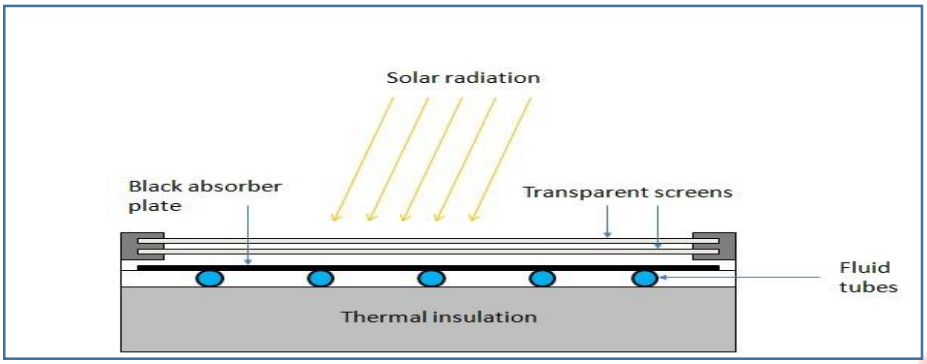
Principle:

- The basic principle for this device is that the sun heats a dark flat surface, which collects as much energy as possible, and then the energy is transferred to water, air, or other fluid for further use.

Construction and Working:

These are the main components of a typical flat-plate solar collector:

- **Black surface :** absorber plate that absorbs the incident solar energy (copper or aluminium sheet coated with selective coating)
- **Glazing cover:** transparent layer that transmits radiation to the absorber, but prevents radiative and convective heat loss from the surface (plastic or glass)
- **Tubes:** contain heating fluid to transfer the heat from the collector
- **Support structure:** protect the components and hold them in place
- **Insulation:** cover sides and bottom of the collector to reduce heat losses (polymeric material)



The schematic of a flat plate solar collector with liquid transport medium is given here.

- The black absorber plate absorbs radiant heat from sunlight.
- The black absorber plate is covered by transparent screens to reduce the heat loss due to convection and radiation to the atmosphere.
- There are tubes carrying water, which gets heated due to the heat absorbed.
- The thermal insulation prevents heat loss during heat transfer.
- The flat-plate systems normally operate and reach the maximum efficiency within the temperature range from 30 to 80 °C, however some new types of collectors that employ vacuum insulation can achieve higher temperatures (up to 100°C).
- Due to introduction of selective coatings, stagnant fluid temperature in flat-plate collectors has been shown to reach 200 °C.
- Flat-plate collectors need to face the sun to obtain maximum sunlight exposure. The installation angle should be equal to or up to 15° higher than the latitude of the location.
- This angle ensures optimal heat output throughout the year. The flat plate solar collectors are highly useful for low temperature heating. The main use of this technology is in residential buildings where the demand for hot water has a large impact on energy bills. Commercial applications include car washes, military laundry facilities and eating establishments.

Q.3.C) What are limitations of conventional sources of energy? (5 M)

Ans:

- Very Costly Production Cost.
- Heavy Transmission & Distribution Loss.
- Limited Reach.
- Big Threat for Environment & Public Health.
- Cause of Global Warming, Greenhouse Effect, Acid Rain Etc.
- Uncertainty in availability, not replenish able, available in limited amount in environment and availability depends on the rate of consumption by humans.
- Electricity Tariff is increasing at about 8 to 10% p.a. on an Average.

Q.4.A) What are green buildings? What are the advantages of green structure. (5 M)

Ans:

Green building (also known as green construction or sustainable building) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from site to design, construction, operation, maintenance, renovation, and demolition.
It is a building which can function using an optimum amount of energy, consume less water, conserve natural resources, generate less waste and create spaces for healthy and comfortable living, as compared to conventional buildings.
This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.
Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of environment on human health by considering:

- Efficient use of energy, water, and other resources,
- Protecting occupant health and improving employee productivity,
- Reducing waste, pollution and environmental degradation.

Green building design is a practical and climate conscious approach to building design. Various factors, like geographical location, prevailing climatic conditions, use of locally available and low embodied energy materials and design parameters relevant to the type of usage of the building are normally taken into consideration.
Green Building over a conventional building help to retain nature to a maximum extent possible in three ways with reference to the location of the buildings.

- Retain the external environment at the location of the building.
- Improve internal environment for the occupants.
- Preserve the environment at places far away from the building.

Advantages:

1- Cost: The construction costs are the same as a standard building and sometime they cost a little bit more as they require special materials to be built. However, a regular building costs won't stop after its construction since money will always be spent on maintenance, renovation, operation or even demolition. This doesn't mean that green buildings won't need maintenance, renovation, operation or even demolition as well, but being built of natural resources all that re-doing stuff will take ages till done as they are not damaged that fast hence, investing in green building is 10 times more profitable than standard ones.
2- Efficiency: This here is divided to the following:-

A- Water efficiency: Green buildings don't know the meaning of "wasted", they recycle rain water and grey water and use them for toilet flushing for instance.

B- Energy Efficiency: These buildings save energy more than those built out of bricks. They only depend on all renewable energy resources such solar power, hydro-power and wind power which are used for heat and electricity and help improve the indoor air quality.

C- Material Efficiency: Green buildings are built from natural, non-toxic and recycled materials that don't cost much and Eco-friendly such as bamboo, straw, recycled metal or concrete etc.

3- Preserving infrastructure: Being efficient in both energy and water supply, these buildings stretch the capacity of local infrastructure greatly.

Q.4.B) Discuss various indoor air pollutants. (5 M)

Ans:

Solvents and Chemicals: Volatile Organic Compounds (VOCs)

- Perfumes, hair sprays, furniture polish, glues, air fresheners, moth repellents, wood preservatives
- Health effect is the imitation of the eye, nose and throat. Severe cases there may be headaches, nausea and loss of coordination, damage to the liver and other parts of the body.

Tobacco smoke: BAP (benzo[a]pyrene)

- Health effects are burning eyes, nose, and throat irritation to cancer, bronchitis, severe asthma, and a decrease in lung function.

Biological pollutants:

- Pollen from plants, mite, hair from pets, fungi, parasites, and some bacteria.
- Health effects cause asthma, hay fever, and other allergic diseases.

Formaldehyde:

- Carpets, particle boards, and insulation foam.
- Health effects is irritation to the eyes and nose and may cause allergies in some people.

Pesticides:

- Health effects include irritation to eye, nose, and throat; damage to central nervous system and kidney, risk of cancer.
- Symptoms may include headache, dizziness, muscular weakness, and nausea.
- Chronic exposure to some pesticides can result in damage to the liver, kidneys, endocrine and nervous systems.

Asbestos:

- Roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products, heat-resistant fabrics, packaging, gaskets, and coatings.
- Health effect is suspected to cause cancer.

Radon:

- Soil, rocks beneath buildings or in certain building materials
- Radioactive particles can damage the cells that line the lung. Long-term exposure to radon can lead to lung cancer.

Q.4.C) What is the role of disaster management? (5 M)

Ans:

- Natural calamities of different types & intensities (Earthquakes, Hailstorms, Cyclones, Hurricanes, Flood, Avalanches, Landslides, Tsunami, etc.) affect Nations all over the World. Not all natural calamities can be predicted and prevented, but a state of preparedness and ability to respond quickly to the natural calamity can considerably mitigate loss of life & property and restore normalcy at the earliest is referred as Disaster Management.
- There are no standardized rules defining the different phases of the disaster management cycle. Different agencies use different cycles depending upon their objectives. However, while approaches vary, it is agreed that disaster management activities should be carried out in a cycle.

1. Mitigation: any activity that reduces either the chance of a hazard taking place or a hazard turning into disaster.
2. Risk reduction: anticipatory measures and actions that seek to avoid future risks as a result of a disaster.
3. Prevention: avoiding a disaster even at the eleventh hour.
4. Preparedness: plans or preparations made to save lives or property, and help the response and rescue service operations. This phase covers implementation/operation, early warning systems and capacity building so the population will react appropriately when an early warning is issued.
5. Response: includes actions taken to save lives and prevent property damage, and to preserve the environment during emergencies or disasters. The response phase is the implementation of action plans.
6. Recovery: includes actions that assist a community to return to a sense of normalcy after a disaster.

Q.5.A) Discuss briefly about greenhouse effect. (5 M)

Ans:

- The greenhouse effect is a naturally occurring process that keeps the Earth's surface and atmosphere warm.
- It is due to the fact that certain atmospheric gases like carbon dioxide, methane, water vapour, are capable of trapping the sun's heat.

- This natural trapping of heat or the greenhouse effect has made Earth habitable. This effect helps to maintain the Earth's mean temperature at 15˚C while in absence of the greenhouse effect it would have been about -18˚C.
- However, due to human activities the concentrations of the greenhouse gases has increased which will enhance the greenhouse effect thereby, increasing the Earth's surface temperature beyond 15˚C. This is referred to as global warming.
- Besides carbon dioxide, methane, nitrous oxide and water vapour other greenhouse gases are include CFCs and ozone.
- Methane is produced naturally when vegetation is burnt, digested or rotted in the absence of oxygen.
- It is also released in paddy fields, coal mines, from rotting garbage dumps and by fossil fuels. Chlorofluorocarbons (CFCs) are man-made industrial chemicals used in air conditioning etc.
- Nitrous oxide occurs naturally in the environment.
- In recent years, their quantities have increased significantly due to the use of chemical fertilizers and the burning of fossil fuels.

Q.5.B) What are the main causes of soil degradation? (5 M)

Ans:

1. **Deforestation:** Forests play an important role in maintaining fertility of soil by shedding their leaves which contain many nutrients. Forests are also helpful in binding up of soil particles with the help of roots of vegetation. Therefore, cutting o forests will affect the soil adversely.
2. **Excessive Use of Fertilizers and Pesticides:** Fertilizers are indispensable for increasing food production but their excessive use has occasioned much concern as a possible environmental threat. Excessive use of fertilizers is causing an imbalance in the quantity of certain nutrients in the soil. This imbalance adversely affects the vegetation.
3. Overgrazing: Increase in livestock population results in overexploitation of pastures. Due to this, grass and other types of vegetation are unable to survive and grow in the area, and lack of vegetation cover leads to soil erosion.
4. **Salination:** Increase in the concentration of soluble salts in the soil is called salination. India has about six million hectares of saline land.
5. Water-logging: Excessive irrigation and improper drainage facility in the fields cause rise in the ground water level. This ground water mixes with surface water used for irrigation and creates a situation called water-logging. Ground water brings the salts of soil in dissolved state up to the surface where they form a layer or sheet of salt after evaporation. The term salinity is used for such a situation.

6. **Desertification:** Desertification is a widespread process of land degradation in arid, semi- arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. The UNO Conference on Desertification (1977) has defined desertification as the "diminution or destruction of the biological potential of land, and can lead ultimately to desert like conditions."

Q.5.C) What are the measures to control the global warming? (5 M)
Ans:

1. Plant maximum number of trees as they releases oxygen and absorbs CO2 present in atmosphere. In this way a tree balance the temperature of air and reduces the amount of CO2 present in air.
2. Vehicles release many harmful gases in the air. Hence try to drive those cars which run on gas or electricity. If possible minimize the use of personal vehicle and travel by public transport. This way we can also control the problem of pollution.
3. Use fans more than air conditioners to use less energy. Hot air releases from air conditioner is one of the major factor behind global warming.
4. Avoid to use water heater or use that on temperature lesser than 120 F.
5. Instead of dryers take an advantage of sun light to dry wet cloths.
6. Unplug all the electrical appliances if they are not in use.
7. For less amount of carbon emission we can also use renewable energy like wind power which generate negligible amount of harmful gases.
8. 8. Use recyclable materials instead of disposable materials. This is good to control on waste.

Q.6.A) Discuss the role for 3R in sustainable development. (5 M)
Ans:

Reduce:

- The more we can reduce (consumption), the less we will need to reuse and recycle. If we first reduce, then we spend less time, money and energy trying to reuse, recycle, control etc.
- It takes resources to manufacture, transport, and dispose of products, so reduction minimizes the use of new resources. In terms of waste management, it is always the best option. Waste production is often due to the inefficient use of resources or bad planning.

Reuse:

- Reuse is the use of materials more than once in their original form instead of throwing them away after each use.

- Reuse keeps new resources from being used for a while longer, and old resources from entering the waste stream. Initiatives include waste exchange, garage sales, quilting, travel mugs, composting (nutrients), laundry, repair, re-gift, and up-cycle.
- Even, repairing of the non-working mechanical, electrical & electronic items/goods is to be done and reuse the same by enhancing/increasing its life/longevity. This also reduces the waste and proved to be economic too.

Recycle:

- Recycling involves converting waste materials into new products, changing them from their original form by physical and chemical processes.
- Although recycling uses energy, it helps to prevent new resources from being used and old materials from entering the waste stream.

Q.6.B) How increasing population is exerting extra pressure on land and mineral resource discuss. (5 M)

Ans:

- The total human population has expanded since the introduction of agriculture, around 12,000 years ago, and its rate of growth has generally increased over time
- The increase in in population growth rate is largely as a result of increased food production, improved sanitation and health care.
- Achieving the first one billion of human population took most of human history, whilst the most recent increase of one billion was achieved in little more than a decade.
- However, recent declines in the rate of growth of population have occurred in many parts of the world, and in some countries populations are now declining.
- The United Nations projects that the world's population will be anywhere between 7.7 billion to 11.2 billion by 2050, that's an average of 9.5 billion by that time.
- Human population growth and overconsumption are at the root of our most pressing environmental issues like depletion of resources, environmental pollution, species extinction crisis, habitat loss and climate change.
- Significant differences exist in cultural attitudes to the issues of human population size and the rate of population growth.

Q.6.C) What do you mean by land filling? Explain briefly. (5 M)

Ans:

- Landfills are a vital component of any well-designed Solid Waste Management system. Landfilling is a process of dumping solid waste in a scientifically

designated land area, spreading waste in thin layers, compacting it to the smallest practicable volume and covering with soil on a daily basis. Methane-rich biogas is produced due to anaerobic decomposition of organic matter in solid waste.

- Landfills range in type from uncontrolled open dumps to secure sanitary landfills. Uncontrolled, open dumps are not a sound practice, but controlled dumps and sanitary landfills can provide effective disposal of a city's solid waste in accordance with appropriate local health and environmental standards.

A modern landfill consists of,

1. Landfill liner is made up of multiple, engineered layers of geosynthetic and natural soil materials underlying the disposal area. It prevents rainfall and other liquids that come in contact with the waste from escaping into the environment. It also restricts the underground migration of landfill gases.
2. Clay cap is a vegetated cover placed over the landfill at completion of filling, consisting of geosynthetic and natural soil materials. It prevents the escape of landfill gases to the air and restricts the infiltration of rain into the landfill.
3. Gas recovery system consists of extraction wells and piping that remove methane and other decomposition gases from the landfill for proper destruction and reuse.
4. Leachate management system consists of pipes placed beneath the waste (and above the liner system) that remove leachate from the landfill for proper treatment. Leachate is described as liquid that has percolated through the layers of waste material and is composed of liquids that originate from a number of sources, including precipitation, groundwater, initial moisture storage, and reactions associated with decomposition of waste materials.
5. Monitoring system that promptly detects the releases to air, surface water and groundwater resources to ensure protection of public health, safety and the environment.