MODEL QUESTION PAPER

TED-(12)2003

SIXTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY

ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

(Maximum Mark:100) (Time: 3 hr)

PART -A

I. (Answer the following questions in one or two sentences, Each question carries 2 marks)

1. What is a food web?

- The food web is the representation of all of the interconnected food chain in an ecosystem.
- Food web shows multiple feeding relationship.

2. Give the different sources of energy?

- Sun for solar energy
- Water for hydroelectric energy.

3**. What is Estuaries?**

Estuaries are wide body of water formed where a large river meets the sea. it contains both fresh water and salt water.

4. List of sources of thermal pollution?

- Industries
- Urban runoff
- Domestic sewage

5. What is flood mitigation?

Flood mitigation is the managing and control of flood water movement, such as redirecting flood run-off through the use of floodwalls and flood gates, rather than trying to prevent floods altogether.

PART-B

II. (Answer any five of the following questions , Each carries 6 marks)

1. List the different factors that effect the soil erosion?

Effects of soil erosion

- **Removes valuable top soi**l -Lower yields and higher costs
- **Lower depth of soil-** available for rooting, and water storage for crop growth

- **If already seeded then**- loss of seeds, seedlings, fertilizer - need to repeat field operations (costly); soil being washed from plant roots
- **Subsoil left (after top soil gone), can't support agriculture** - ground full of small rills and gullies - can't work the land
- **Water erosion of soil** - damage to roads and railway lines; may be deposited on other land or in water courses, rivers, lakes, estuaries; pesticides in washed into streams
- **Sedimentation** can causing a greater flooding downstream.
- **Sediment in rivers** -damages spawning grounds of fish
- **Erosion of the side of hills** - avalanches - loss of life and homes
- **Underground erosion of soils** - collapse of top ground
- **Severe drought and winds** - dust bowl - western plains area see photos

2**. Give the impact of mining on environment and human beings?**

The **environmental impact of mining** includes erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater, surface water by chemicals from mining processes. In some cases, additional forest logging is done in the vicinity of mines to increase the available room for the storage of the created debris and soil.[1] Besides creating environmental damage, the contamination resulting from leakage of chemicals also affect the health of the local population.[2] Mining companies in some countries are required to follow environmental and rehabilitation codes, ensuring the area mined is returned to close to its original state. Some mining methods may have significant environmental and public health effects.

Humans are also affected by mining. There are many diseases that can come from the pollutants that are released into the air and water during the mining process.

3. Explain the different types of ecological pyramid?

There are having three types of ecological pyramid, they are:

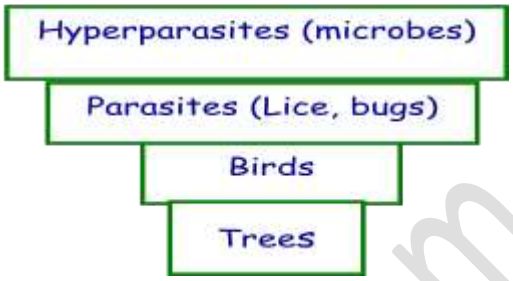
i. Pyramid of numbers

ii. Pyramid of biomass, and

iii. Pyramid of energy or productivity

Pyramid of number

The pyramid of numbers shows the relationship between producers, herbivores and carnivores at successive trophic levels in terms of their numbers.



Pyramid of biomass

- If the numbers of consumers at each tropic level are multiplied by their weight, then, what we obtain is the pyramid of biomass.
- It indicates by weight or other measurement

Pyramid of energy

Of the ecological pyramids, the energy pyramid gives the best picture of the overall nature of an ecosystem. The pyramid of energy is based on the total energy content of each trophic level.

4. List the characteristics of forest ecosystem?

Characteristics of a forest ecosystem

- Forest has warm climate with adequate rain fall.
- Forest has well defined seasons of about equal length.
- Forest protects biodiversity.
- Forest has tall and dense trees with many wild animals within ecosystem.
- The soil of forest is rich in organic matter and nutrients.
- Forest grows very slowly.
- Forests provide various resources for human life.

5. List the effect of radio active pollution on environment?

- Exposure of the brain and central nervous system ot high doses of radiation causes delirium, convulsions and death within hours or days.
- The use of eye is vulnerable to radiation. As its cell die, they become opaque forming cataracts that impair sight.
- Acute radiation sickness is marked by vomiting; bleeding of gums and in severe cases mouth ulcers.
- Nausea and vomiting often begin a few hours after the gastrointestinal tract is exposed. Infection of the intestinal wall can kill weeks afterwards.
- Unborn children are vulnerable to brain damage or mental retardation, especially if irradiation occurs during formation of the central nervous system in early pregnancy

6. Write short notes on ozone layer depletion?

Ozone layer depletion

- Though ozone is harmful gas near the earth surface (photo toxic) it is very useful in the upper layers (15 to 40 Km) of the atmosphere (stratosphere).
- 90% of the ozone is concentrated in the stratosphere and absorbs 95% of the UV radiation.
- It is useful gas there, as it absorbs the ultraviolet portion of the solar radiation which is very much harmful to human beings.
- It produces skin cancer and other diseases.
- Unfortunately because of the air pollution this ozone layer is depleting and wherever the concentration becomes very low it is termed as ozone hole.

Effects of Ozone Layer Depletion

- Skin cancer of various types including the dangerous melanoma. About 1 lack people die from this disease. As an estimate the cases of skin cancer are doubled with a 25% reduction in ozone layer.
- The ultraviolet radiation directly increases the cataract (disease of eyes).
- The UV radiation affects the eyes of wild life also and as they cannot protect themselves this effect is more pronounced.

7. Distinguish between environmental hazard and disaster?

Hazard :

Hazard is defined as a perceived natural event which threatens both life and property.

There are two types of hazards:

1. Natural hazard.
2. Manmade hazard.

1.Natural hazard

Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological or even biological origin).

Examples: - cyclones, tsunamis, earth- quake

2. Manmade hazards

Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc.

Disaster

The occurrence of a sudden or major misfortune which gives rise to casualties and / or damage or loss of property, infrastructure, essential services etc.

Disasters are often classified according to their:

a) Causes – Natural disaster and Manmade disaster

b) Speed of onset – Sudden and Slow

- **Natural Disasters**

These types of disaster naturally occur in proximity to, and pose a threat to, people, structures or economic assets.

Examples are Storm, Flood, Earthquake, Tsunamis

- **Manmade Disasters**

Accidents: Road, Rail, Air, Sea, Building collapse.

Industrial Mishaps: Gas leak, Explosion, Safety.

Fire: Building, Coal, Oil.

Forest Fire (In tropical counters, forest fires are often manmade)

- **Speed of onset**

1 Sudden onset: little or no warning, minimal time to prepare. For example, an earthquake, tsunami, cyclone, volcano, etc.

2 Slow onset: adverse event slow to develop; first the situation develops; the second level is an emergency; the third level is a disaster.

For example, drought, civil strife, etc.

PART -C

(Answer one full question from each unit, Each question carries 15 mark)

MODULE -I

III. (a) Explain the role of an individual in conservation of natural resources. (8)

ROLE OF AN INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES.

I. Conserve Water

- Don't keep water taps running while brushing, shaving, washing or bathing.
- Check for water leaks in pipes and toilets and repair them promptly. A small pin-hole sized leak will lead to the wastage of 640 liters of water in a month.
- Install a small system to capture rain water and collect normally wasted used water from sinks, cloth-washers, bathtubs etc. which can be used for watering the plants

2. Conserve energy

- Turn off lights, fans and other appliances when not in use.
- Obtain as much heat as possible from natural sources. Dry the clothes in sun instead of drier if it is a sunny day.
- Use solar cooker for cooking your food on sunny days which will be more nutritious and will cut down on your LPG expenses.
- Try riding bicycle or just walk down small distances instead of using your car or scooter.

3. Protect the soil

- While constructing your house, don't uproot the trees as far as possible. Plant the disturbed areas with a fast growing native ground cover.
- Make compost from your kitchen waste and use it for your kitchen-garden or flower-pots.
- Do not irrigate the plants using a strong flow of water, as it would wash off the soil.
- If you own agricultural fields, do not over-irrigate your fields without proper drainage to prevent water logging and salinisation.

(b) Give the effect of deforestation on environment. (7)

Environmental effects of deforestation

- Food problems
- Ecological imbalance
- Increasing CO2
- Floods leading to soil erosion
- Destruction of resources
- Heavy siltation of dams
- Changes in the microclimate
- Loss of bio-diversity
- Heavy rainfall and high sunlight
- Where forests are replanted, their replacement can mean a loss of quality
- Deforestation can cause the climate to become extreme in nature. The occurrence and strength of floods and droughts affecting the economy.
- The stress of environmental change may make some species more susceptible to the effect of insects, pollution, disease and fire.
- Most humid regions changes to desert
- Environmental pollution
- Global warming.

OR

IV. (a) Explain the effect of modern agricultural technology on environment. (8)

Effects due to adoption of modern agricultural technology

- **Impacts related to high yielding varieties:-** The use of high yielding varieties encourage monoculture. In case of an attack by some pathogen, there is total devastation of the crop by the disease due to exactly uniform conditions, which help in rapid spread of disease.
- **Fertilizer related problems:-** Micronutrient Imbalance. Most of the chemical fertilizers used in modern agriculture have nitrogen, phosphorus and potassium which are essential macronutrients Farmers use these indiscriminately to boost up crop growth.
- **Nitrate Pollution :-** Nitrogenous fertilizers applied in the fields often leach deep into soil and ultimately contaminate the ground water.
- **Eutrophication** :-Eutrophication means over nourishment .Due to eutrophication lakes get invaded by algal blooms; these algae grows very fast by rapidly using up the nutrients, they often are toxic and badly affect the food chain.
- **Pesticide related problems:-** Creating resistance in pests and producing new pests. Some individuals of the pest species usually survive even after pesticide spray. The survivors give rise to highly resistant generations.
- **Death of nontarget organisms** - Many insecticides are broad spectrum poisons which not only kill the target species but also several nontarget species which are useful to us
- **Biological magnification** - Many of the pesticides are not biodegradable and keep on accumulating in the food chain, this process is called as biomagnifications.
- **Water logging:-** Over irrigation of croplands by farmers for good growth of their crop usually leads to water logging. Or in other words, it is the saturation of the soil with irrigation water so that the water table raises close to the surface.

(b) List the advantages of Dam. (7)

Benefits of Dams:

- Dams ensure a year round supply of water for domestic use and provide extra water for agriculture, industries and hydropower generation.
- River valley projects with big dams play a key role in the development process due to their multiple uses.
- These dams aim at providing employment for tribal people and raising the standard and quality of life.
- Dams can help in checking floods and generate electricity
- Dams reduce water and power shortage.
- Dams provide irrigation water to lower areas.
- It provide drinking water in remote areas.
- Dams help to promote navigation and fishery.

MODULE -II

V. (a) Explain the structure and of an ecosystem. (8)

(b) Give the characteristics of desert ecosystem. (7)

General characteristics of Desert

- Deserts are subjected to high wind velocity
- There is low annual rain fall.
- The desert air is dry and climate is hot.
- Temperature variations is large (days are hot and nights are cold)
- It doesn't have vegetation or rare vegetation and the animals face shortage of food. .
- Soil is loose, sandy, devoid of organic carbon, nitrogen and moisture etc.
- Low humidity during the day and high in night.
- Solar radiation very intense.
- Absence of water vapour in air.
- Scarcity of water in hot deserts.
- Human population is very small.
- The number of sunshine hours is very large.
- Drought in other words, the effective aridity, is long in the extreme arid zone.
- Precipitation deficiency is the main feature of deserts.

OR

VI. (a) Write ecological pyramid. (8)

ECOLOGICAL PYRAMIDS

The tropic levels of an ecosystem can be expressed in a diagrammatic way in the form of ecological pyramids. The ecological pyramid basically consists of three parts; the base, body and the apex.

There are having three types of ecological pyramid, they are:

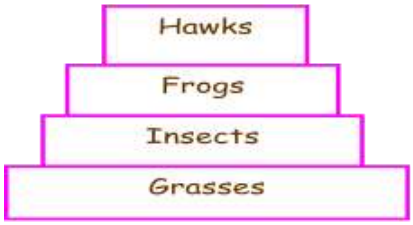
i. Pyramid of numbers

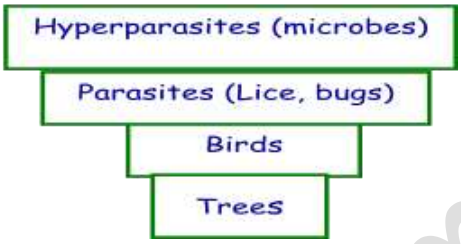
ii. Pyramid of biomass, and

iii. Pyramid of energy or productivity

Pyramid of number

The pyramid of numbers shows the relationship between producers, herbivores and carnivores at successive trophic levels in terms of their numbers.





Pyramid of biomass

- If the numbers of consumers at each tropic level are multiplied by their weight, then, what we obtain is the pyramid of biomass.
- It indicates by weight or other measurement

Pyramid of energy

- Of the ecological pyramids, the energy pyramid gives the best picture of the overall nature of an ecosystem. The pyramid of energy is based on the total energy content of each trophic level. The total energy content of each trophic level depends on the following factors.
- They are the amount of energy that.

(b) Give the characteristics of forest ecosystem. (7)

Characteristics of a forest ecosystem

1. Forest has warm climate with adequate rain fall.

2. Forest has well defined seasons of about equal length.

3. Forest protects biodiversity.

4. Forest has tall and dense trees with many wild animals within ecosystem.

5. The soil of forest is rich in organic matter and nutrients.

6. Forest grows very slowly.

7. Forests provide various resources for human life.

MODULE – III

VII. (a) Explain effect and control measures of water pollution. (8)

EFFECTS OF WATER POLLUTION

- Large amount of human waste in water increase the number of bacteria such as Escherichia coli and streptococcus sps which cause gastro intestinal diseases. Water borne diseases diarrhea, typhoid etc.
- If more organic matter is added to water the O2 is used up. This causes fish and other forms of O2 dependent aquatic life dies.
- Excess pesticides cause Biomagnification.
- High levels of organic chemicals (acids, salts& toxic metals) can make the water unfit to drink, harm fish and other aquatic life, reduce crop yields
- Variety of organic chemicals / oil gasoline, plastics detergents) are harmful to aquatic life and human life

CONTROL MEASURES FOR PREVENTING WATER POLLUTION TREATMENT

ii. Preliminary treatment
ii. Primary treatment
iii. Secondary treatment
iv. Tertiary Treatment

Preliminary Treatment

It involves the following processes

- Screening
- Grinding
- Skimming tank.

Primary Treatment:-

In primary treatment, the settleable organic solids like faecal matter etc. are sedimented and finally removed for further treatment. This is accomplished in primary sedimentation tanks.

Secondary Treatment

The effluent from the primary sedimentation tank still contains unstable organic substances in the colloidal and dissolved formThese substances have to be removed by further treatment called secondary treatment, in which micro organisms are employed.

Tertiary Treatment

If the effluent from a secondary treatment plant is not satisfactory, tertiary treatment may be required. This consists of many processes including Coagulation, Membrane separation processes, Filtration, Co-precipitation etc.

(b) Explain various methods of solid waste management. (7)

SOLID WASTE MANAGEMNT

- Anything that is not of further use in a process is known as waste for that process.
- That can be useful for other process and can be termed as raw material for that process.

- So actually waste is a misplaced resource. When this waste is in a comparatively solid form it is known as the solid waste. Whatever may be the form of waste,
- It deteriorates the environment if it is disposed in an offensive manner.
- The waste water and its treatment and disposal have already been discussed.
- Solid waste is defined as discarded solid fraction produced from domestic, commercial, trade, industrial, agricultural, institutional, mining activities and public services.
- The waste is a term that means useless, unwanted or discarded material.

OR

VIII. (a) Write short notes on noise pollution. (6)

NOISE POLLUTION

- Noise is defined as 'unwanted or offensive sound that unreasonably intrude into our daily activities.
- Sound or noise can affect us because of its loudness and pitch or frequency.
- Frequency is the number of cycles per second called Hertz (Hz).
- For example, a radio station uses certain frequencies for the broadcast.
- The human ear is sensitive to the sound of frequency in the range of 20 to 2000Hz.
- Loudness is measured in decibel scale (dB), a tenfold increase in sound intensity is represented as 10 dB increase on scale.
- Sound is measured in a unit called the decibel (dB). The permitted noise level is 125 decibels as per the Environment Protection Rules 1999.

(b) Explain the different measures to control air pollution. (9)

CONTROLE MEASURES OF AIR POLLUTION

There are 4 fundamental ways in which noise can be controlled.

i. Reduce noise at the source

ii. Block the path of noise

iii. Increase the path length and

iv. Protect the recipient.

i. Reduce noise at the source

- Make sure that all openings are acoustically sealed. Noise, lake water rushes out through any cracks or openings. Muffling vehicles and machinery to reduce the noise.
- In industries, different types of absorptive material can be used to control interior noise. Noise reduction can be done by using rigid sealed enclosures around machinery lined with acoustic absorbing material. Isolating machines and their enclosures from the floor using special spring mounts or absorbent mounts and pads and using flexible couplings for interior pipelines also contribute to reducing noise pollution at the source

ii. Block the path of noise:

Through construction of temporary/permanent barriers

- Planting of trees around houses can also act as effective noise barriers.
- Highly absorptive interior finish material for walls, ceilings and floors can decrease indoor noise levels significantly.

iii. Increasing the path length:

Increasing distance from the noise source and the recipient offers a passive means of control.

- Municipal land- use ordinances pertaining to the location of airports make use of the attenuating effect of distance on sound levels.

MODULE – IV

IX. (a) Explain the three stages of disaster management. (9)

THE THREE STAGES OF DISASTER MANAGEMENT

1. Pre-disaster stage

2. Emergency stage and

3. Post-disaster stage.

Pre-disaster stage

This stage includes preparedness and mitigation for the disaster. The preparedness for disaster in general consists of:-

- Preparing hazard zonation maps, predictability/forecasting and warning.
- Preparing disaster preparedness plan
- Land use zoning.
- Preparedness through IEC

Emergency stage

- This stage of disaster management comprises of rescue and evacuations, shelter for victims, relief for livestock, disposal of dead and finally damage assessment survey.
- The stage requires a "Rapid Action Task Force", that is aware of the contextual social norms and conditions and is psychologically attuned to face the abnormal human conditions.
- The team should have the concern and technical knowledge and skills to conduct such operations.
- The contextual findings of the region of disaster reveal that during emergency stage the major role is played by administration alone.
- With the limited resources, the administration can hardly perform these operations effectively.

- To deal with this, it is required that local people are trained to handle the emergency situation.
- The formulation of disaster management committees at local level may be another alternative. If various NGOs, local bodies (Panchayaths),
- National Social Service Core, and other voluntary organizations are given adequate responsibility and resources to tackle emergency situation, the result will be better and satisfactory.

Post Disaster stage

1. **Rehabilitation and reconstruction**

- Specifically, rehabilitation is the actions taken in the aftermath of a disaster to enable basic services to resume functioning, assist victims' self-help efforts to repair dwellings and community facilities, and facilitate the revival of economic activities (including agriculture).

2. Political administrative Aspect

Recovery from major disaster events necessitates large quantities of material and human resources and good organizational/institutional capacity.

3. Economic Aspect

Governments face a dilemma following any disaster that causes extensive damage to both the local economy and to the physical environment.

4. Environmental impacts

Disasters almost always have negative environmental impacts, ranging from damage to ecosystems to the production of vast quantities of waste.

(b) Write down the causes of the disaster due to nuclear explosion. (6)

Causes of nuclear explosion

- An accident taking place in any nuclear facility of the nuclear fuel cycle including the nuclear reactor, or in a facility using radioactive sources, leading to a large scale release of radioactivity in the environment.
- A 'criticality' accident in a nuclear fuel cycle facility where an uncontrolled nuclear chain reaction takes place advertently, leading to bursts of neutrons and gamma radiations.
- An accident during the transportation of radioactive material.
- The use of radioactive material as a Radiological Dispersal Device by terrorists for dispersing radioactive material in the environment.
- A large-scale nuclear disaster, resulting from a nuclear weapon attack (as had happened at Hiroshima and Nagasaki) which would lead to mass casualties and destruction of large areas and property.

OR

X. Write short notes on the following.

(a) Bhopal gas tragedy. (5)

(b) Hazard zonation map. (5)

(c) Effect of land slid. (5)

Ans:-

(a) BHOPAL GAS TRAGEDY.

- The Bhopal disaster also known as Bhopal Gas Tragedy was one of the world's worst industrial catastrophes.
- It occurred on the night of December 2–3, 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh, India.
- A leak of methyl isocyanate gas and other chemicals from the plant resulted in the exposure of hundreds of thousands of people. Estimates vary on the death toll.
- The official immediate death toll was 2,259 and the government of Madhya Pradesh has confirmed a total of 3,787 deaths related to the gas release.
- Others estimate 3,000 died within weeks and another 8,000 have since died from gas-related diseases.
- A government affidavit in 2006 stated the leak caused 558,125 injuries including 38,478 temporary partial and approximately 3,900 severely and permanently disabling injuries.

(b) HAZARD ZONATION MAP.

- Disaster mapping is a tool for. assessing, storing and conveying information on the geographical location of a disaster occurrence and spread of the effects or probable effects of disasters..
- Every year in a country like India, natural disasters like floods and cyclones are fairly frequent.
- Earthquake also occur time and again.
- The occurrence of such disasters, their intensity, the area /region of their occurrences and their impacts has to be assessed, so as to have information /data about the damages caused by them to the area /population specific or probable damages or impact likely to be caused.
- Proper mapping will be helpful not only for pre-disaster preparedness but also in rescue and relief operations with greater accuracy and speed.
- With the data / information collection, storage, retrieval becoming highly technological and scientific, new specialized techniques like Geographical Information System (GIS) are increasingly used for disaster mapping and these are proving to be very useful.

(c) LANDSLIDE

- The term' landslide' includes all varieties of mass movements of hill slopes and can be defined as the downward and outward movement of slope forming materials composed of rocks, soils, artificial fills or combination of all these materials along surfaces of

separation by falling, sliding and flowing, either slowly or quickly from one place to another.

- Although the landslides are primarily associated with mountainous terrains, these can also occur in areas where an activity such as surface excavations for highways, buildings and open pit mines takes place. They often take place in conjunction with earthquakes, floods and volcanoes.
- At times, prolonged rainfall causing landslide may block the flow of river for quite some time.