TED (15) 3001B
(Revision - 2015)

A20 – 08746

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2020

ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

[Maximum Marks: 75] **[Time: 2.15 Hours]**

PART-A

(Answer *any three* questions in one or two sentences. Each question carries 2 marks)

I

1. List the biotic components of ecosystem
2. Define deforestation
3. List the main causes of soil pollution
4. Define vulnerability
5. List any two institutional frame work of disaster management in our state

(3x2=6)

PART-B

(Answer any *four* of the following questions. Each question carries *6* marks)

II

1. Recall The Bhopal disaster
2. Explain Global Warming
3. Summarize Ecological Pyramids
4. Discuss the causes of desertification
5. Explain the three stages of disaster management cycle
6. List the characteristics of forest ecosystem
7. Briefly explain Salinity

(4x6=24)

PART-C

(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT - I

III.	a) Identify the different methods of harvesting solar energy and explain any two methods	7
	b) Explain (i) Flood (ii) Drought	8

OR

IV.	a) List and explain three renewable energy sources	8
	b) Classify the advantages and the disadvantages due to large dams	7

UNIT – II

V.	a) Explain the types, structure and characteristic features of forest ecosystem	10
	b) Explain the phenomenon ecological succession	5

OR

VI.	a) Describe the importance of biodiversity	5
	b) Explain the structure and characteristic feature of desert ecosystem	10

UNIT – III

VII.	a) Illustrate any three methods to control air pollution	10
	b) Identify the factors contributing thermal pollution	5

OR

VIII	a) Explain Environmental Impact Assessment (EIA)	5
	b) Identify the various categories of solid wastes and explain	10

UNIT – IV

IX	a) Distinct between hazard and disaster	7
	b) Explain new and emerging approaches in disaster management	8

OR

X.	a) Explain institutional framework of disaster management in national level	8
	b) Explain the communal based disaster preparedness	7

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ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

[Maximum Marks: 75] **ANSWER KEY** **[Time: 2.15 Hours]**

PART-A

(Answer *any three* questions in one or two sentences. Each question carries 2 marks)

I

1. **List the biotic components of ecosystem** - plants, animals and micro-organisms
2. **Define deforestation** - Deforestation is the permanent removal of trees from land which is then converted to a non-forest use.
3. **List the main causes of soil pollution** -
- Agricultural practices
- Urban wastes
- Industrial wastes and wastewater
- Mining and quarrying

(3x2=6)

4. **Define vulnerability** - The extent to which a commodity, structure, services or geographical areas are likely to be damaged or disputed by the impact of a particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area
5. **List any two institutional frame work of disaster management in our state**
   - District Disaster Management Authority (DDMA)
   - **State Disaster Management Authority**

PART-B

(Answer any/our of the **following questions. Each qu**estion carries *6* marks)

II

1. **Recall The Bhopal disaster**

BHOPAL DISASTER The Bhopal disaster or Bhopal gas tragedy was an industrial accident. It happened at a Union Carbide subsidiary pesticide plant in the city of Bhopal, India. On the night of 2-3 December 1984, the plant released approximately 40 tonnes of toxic methyl isocyanate (MIC) gas, exposing more than 500,000 people to toxic gases. A mixture of poisonous gases flooded the city, causing great panic as people woke up with a burning sensation in their lungs. Thousands died immediately from the effects of the gas. Many were trampled in the panic that followed. The first official immediate death toll was 3,598 in 1989. Another estimate is that 8,000 died within two weeks, that an additional 8,000 have since died from gas-related diseases The disaster happened because water entered a tank containing Methyl isocyanate. This caused a chemical reaction which resulted in the buildup of much Carbon dioxide, among other things. The resulting reaction increased the temperature inside the tank to reach over 200 °C (392 °F).

2. **Explain Global Warming**

Global Warming is the increase of Earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide, CFC emissions from burning fossil fuels or from deforestation, which trap heat that would otherwise escape from Earth

Causes of global warming

1. Burning fossil fuels

- When we burn fossil fuels like coal, oil and gas to create electricity or power our cars, we release CO2 pollution into the atmosphere.

2. Deforestation & Tree-Clearing

- Plants and trees play an important role in regulating the climate because they absorb carbon dioxide from the air and release oxygen back into it.

3. Agriculture & Farming

- Some fertilizers that farmers use also release nitrous oxide, which is another greenhouse gas.

4. Power Plants

5. Transportation

6. Deforestation

- Deforestation to use wood for building materials, paper and fuel increases global warming in two ways -- the release of carbon dioxide during the deforestation process and the reduction in the amount of carbon dioxide that forests can capture.

7. Oil Drilling

- Burn-off from the oil drilling industry impacts the carbon dioxide released into the atmosphere.

8. Garbage

9. Volcanic Eruption

EFFECTS OF GLOBAL WARMING

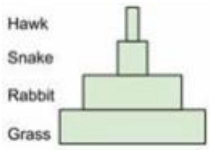
- Melting glaciers, early snowmelt, and severe droughts will cause more dramatic water shortages and increase the risk of wildfires
- Rising sea levels will lead to coastal flooding
- Forests, farms, and cities will face troublesome new pests, heat waves, and increased flooding. All those factors will damage or destroy agriculture and fisheries
- Disruption of habitats such as coral reefs and Alpine meadows could drive many plant and animal species to extinction
- Allergies, asthma, and infectious disease outbreaks will become more common due to increased growth of pollen-producing ragweed, higher levels of air pollution, and the spread of conditions favorable to pathogens and mosquitoes

3, **Summarize Ecological Pyramids**

ECOLOGICAL PYRAMIDS

- These are the graphical representationsof trophic levels in an ecosystem

- They are pyramidal in shape.
- The pyramid is presentedin the form of a triangle or stacked rectangles.



- They are of three types:

1. Pyramid of numbers
2. Pyramid of biomass
3. Pyramid of energy

- The producers makes the base of the pyramid and tertiary carnivores occupy the apex of the pyramid.

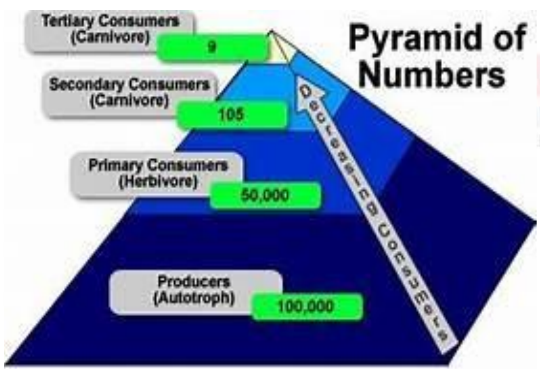
- The area of each segment of pyramid is proportional to the number/biomass/energy

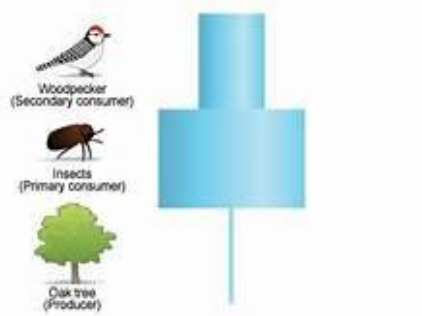
Pyramid of biomass

- The amount of living material present in an ecosystem is called biomass
- It is measured as fresh or dry weight
- It is expressed as gm/unit area

PYRAMID OF NUMBERS

- It is the graphical representation of the number of individuals at successive trophic levels of a food chain per unit area at any time.





Pyramid of energy

- This pyramid represents the total amount of energy at each trophic level.
- It is expressed in terms of kcal/unit area/ unit time.

4. **Discuss the causes of desertification**
    - Deforestation
    - Overgrazing
    - Water management
    - Mining and quarrying
    - Climate change
    - Pollution
5. **Explain the three stages of disaster management cycle**

- ***Pre-disaster stage*** *- Preparedness is a continuous cycle of planning, managing, organizing, training, equipping, exercising, creating, evaluating, monitoring and improving activities*
- ***Emergency stage*** *- The response phase includes the mobilization of the necessary Emergency services and first responders in the disaster area. This is likely to include a first wave or core emergency services, such as firefighter, police and ambulance crews. They may be supported by several secondary emergency services, such as specialist rescue teams.*
- ***Post disaster stage*** *- The recovery phase starts after the immediate threat to human life has diminished. The aim of the recovery phase is to restore the affected area to its previous state.*

6. **List the characteristics of forest ecosystem**
    - Characteristics of a forest ecosystem
    - Forest has warm climate with adequate rainfall
    - Forest have well defined seasons of about equal length
    - Forest protect biodiversity
    - It has tall and dense trees with many wild animals within ecosystem
    - The soil of forest is rich in organic matter and nutrients
    - Forest grow very slowly
    - Forests provide various resources for human life.
7. **Briefly explain Salinity**

Salinity is the accumulation of salt in land and water to a level that damages the natural and built environment. Salinity usually occurs with other natural resource problems such as decreasing soil and water quality, erosion and loss of native vegetation. Salt that accumulates in soil can come from a number of sources:

- Rainfall – airborne salts from ocean spray and pollution are dissolved in atmospheric moisture and deposited on the land when it rains.
- Weathering – minerals that make up rocks break down and release ions that are able to form salts.
- Aeolian deposits – wind picks up and transports dust and salt from soil and lake surfaces and redistributes it across the landscape.
- Connate salt – during deposition, salt has been incorporated into marine sediments, or in areas of internal drainage, salt has accumulated over geologic time due to transport and evaporative processes. These areas may later become sources of salt.

(4x6=24)

PART-C

(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT - I

III. a) **Identify the different methods of harvesting solar energy and explain any two methods** **7**

SOLAR WATER HEATERS - A great example of a thermal solar energy harvesting application that's commonly implemented in sunny climates around the globe is a solar water heater. The simplest version of a solar water heater system uses a pump to circulate cool water through a black body panel. This visually resembles a PV solar panel, where the black surface efficiently absorbs thermal energy, which is then cooled by the circulated water, thereby heating the water. The water is continually circulated through this loop, creating warm water throughout the solar activity. Some systems can forgo a pump system by utilizing the buoyancy created by the heated water. This warmer water 'floats' and the colder water sinks, producing low amounts of flow in the system, creating a thermosiphon. These systems require the storage tank to be above the solar absorption source

VACCUUM TUBE SOLAR WATER HEATER - More advanced and efficient solar water heating systems utilize vacuum tubes and self-contained heat pipes to transfer thermal energy to a secondary tank. The vacuum tube ensures that radiant energy can enter the system, but all energy that gets turned into thermal energy is contained in the tube. The heat pipe absorbs this energy and subsequently transfers it to the large water tank. These systems are significantly more efficient at heating water during cold months, as minimal amounts of thermal energy escape the vacuum tube, allowing nearly all radiant energy to be converted into thermal energy.

b) **Explain (i) Flood (ii) Drought** **8**

FLOOD

- ***Causes of Flood***

1. *Heavy rainfall*
2. *Heavy siltation of riverbed reducing its water carrying capacity.*
3. *Blockage in drains.*
4. *Landslides blocking the flow of stream.*
5. *Construction of dams and reservoirs.*
6. *Cyclones can result in floods (storm surge associated with cyclone)*

Adverse Effects of Flood

- *Damage of structures like houses, bridges, roads etc…*
- *Loss of life and livestock*
- *Crop loss due to flooding of agricultural area.*
- *Contamination of drinking water.*
- *Damages communication and power networks.*
- *Spread diseases(epidemics)*
- *May affect soil characteristics might making the soil less fertile*

DROUGHT

- *Any unusual dry period that results in shortage of useful water.*
- *Drought is the negative balance between precipitation (rainfall) and water use.*
- *Drought can occur by improper distribution of rain in time and space and not just by its amount.*
- **CAUSES** - *Basically, it is due to insufficient rainfall.*
- *Overpopulation, overgrazing, deforestation, soil erosion, excessive use of ground and surface water, loss of biodiversity etc makes the effects of drought worse.*
- *Meteorological drought: absence or reduction in rainfall.*
- *Hydrological drought: reduction in natural stream flows or ground water.*
- *Agricultural drought: Related to agriculture.*

OR

IV. a) **List and explain three renewable energy sources** **8**

- 1. SOLAR ENERGY - *Solar energy is the radiation from the Sun capable of producing heat, causing chemical reactions, or generating electricity.*
- *It is attractive as a renewable energy source because of its inexhaustible supply and its nonpolluting character*
- *solar thermal technologies can be used for water heating, space heating, space cooling and process heat generation*

2. Hydro power energy

- *potential energy is converted to electricity*
- *Low operating and maintenance costs*
- *Renewable*
- *Generation and maintenance cost is low*
- *Have long life*
- *High efficiency*
- *Water also used for irrigation, water supply etc*

3. *WIND ENERGY - Wind energy, or wind power, is created using a wind turbine, a device that channels the power of the wind to generate electricity. The wind is a clean, free, and readily available renewable energy source*

b) **Classify the advantages and the disadvantages ‹Jue to large dams** **7**

DISADVANTAGES

1. The cost of construction is very high.
2. Sometimes takes decades for construction of dams.
3. High standard materials are required to built dams.
4. Regular maintenance of dams is necessary.
5. Relocation of people living in the surrounding areas of dams. Hence loss of farms and land.
6. The flow of river water is disturbed and may disturb the habitat of wildlife.
7. Risk of flood if dams break by earthquake
8. Dam construction leads to significant loss of farmlands and forest.
9. Conflicts for water takes place due to an unequal distribution of water.
10. Natural disasters.

ADVANTAGES

1. Water Stored in dams are used for irrigation.
2. Generation of electricity from the water released through dams.
3. Renewable source of energy. Whenever electricity needed it can generate from the stored water.
4. No pollution occurs during generation of electricity. Clean source of energy.
5. Hydroelectricity produced by dams does not produce any waste product.
6. The hydroelectricity power plants are long lasting and maintenance cost is low compared to others.
7. Flood control by holding water.
8. Supply of water to less rainfall areas.
9. Picnic spot (Boating) etc.

UNIT — II

V. **a) Explain the types, structure and characteristic features of forest ecosystem** 10

Forest ecosystem- formed by a community of plants defined by its trees,shrubs,climbers and ground cover.

Characteristics of a forest ecosystem

- Forest has warm climate with adequate rainfall
- Forest have well defined seasons of about equal length
- Forest protect biodiversity
- It has tall and dense trees with many wild animals within ecosystem
- The soil of forest is rich in organic matter and nutrients
- Forest grow very slowly
- Forests provide various resources for human life.
- Producers – trees, shrubs and ground vegetation
- Primary consumers – ants, flies, beetles, deer, squirrel etc
- Secondary consumers – snakes, birds, lizards,fox etc
- Tertiary consumers – lion, tiger
- Decomposers – bacteria, fungi, etc

TYPES

1. Tropical rainforest – are found near the equator.

   These regions experience very high annual rainfall and also high average temperatures
2. DECIDUOS FORESTS - These are the trees that lose their leaves each year. During spring, they produces thousands of new leaves filled with chlorophyll
3. CONIFEROUS FORESTS - These are the trees that lose their leaves each year During spring, they produces thousands of new leaves filled with chlorophyll

b) **Explain the phenomenon ecological succession** 5

- Ecological succession is a continuous change or origination of a biological community.
- It is because the new plant and animal species come into an area and alter the environmental conditions.

- 3 types

1. Primary succession
2. Secondary succession
3. Aquatic succession

- Primary succession : It is the series of community changes which occur on an entirely new habitat which has never been colonized before. Slow process.

Eg: a newly quarried rock face or sand dunes

- Secondary succession : Series of community changes which takes place on a previously colonized, but disturbed or damaged habitat.

Eg : after felling trees in a woodland, land clearance or fire

- Aquatic succession: Natural succession seen in lakes or ponds in which they are gradually filled and taken over by the surrounding terrestrial ecosystem.

OR

VI, a) **Describe the importance of biodiversity** 5

1. **It serves as a immediate benefits to the society such as recreation and tourism.**
2. **Drugs, herbs, food and other important raw materials can be derived from plants and animals.**
3. **It also preserves the genetic diversity of plants and animals.**
4. **Ensures the sustainable utilization life supporting systems on earth.**
5. **It leads to conservation of essential ecological diversity.**

b) **Explain the structure and characteristic feature of desert ecosystem** 10

- Occur when annual rainfall is less than 25cm and evaporation rate is high.
- They are characterized by extremely hot days and cold nights.
- The vegetation is ground cover, stunted bushes, or occasional trees which is adapted for life in such difficult conditions.
- Clouds are rare in this region.
- **Abiotic components:**
- Due to high temperature and very low rainfall, organic substances are poorly present in the soil.
- **Biotic components**:
- **Producers** : shrubs, bushes, hardy grasses, cactus
- **Consumers** : insects, reptiles, birds, camels
- **Decomposers** : thermophiles bacteria and fungi

CHARACTERISTICS OF DESERT

- High wind velocity
- Low annual rainfall

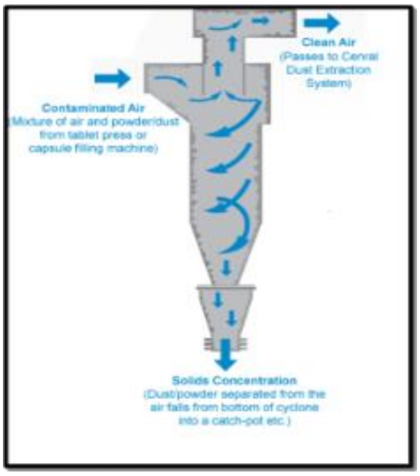
- Air is dry and climate is hot
- Rare vegetation
- Loose soil, sandy devoid of organic carbon, nitrogen and moisture etc
- Low humidity during day and high in night
- Very intense solar radiation
- Scarcity of water
- Low human population

UNIT -III

VII. a) **Illustrate any three methods to control air pollution** 10

Pollution Control Devices

1. Cyclone Separator



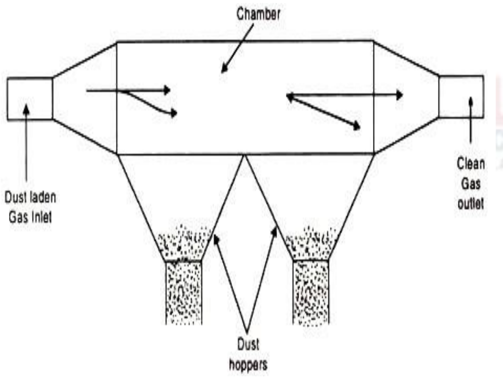
Transforms the inlet gas velocity into a double vortex motion inside the chamber, which separates particulate matter through bottom

2. Fabric filters

- ***Fabric collectors use filtration to separate dust particles from dusty gases. Gases enter the bag house and pass through fabric bags that acts as filters. The bags can be cotton, synthetic or glass fiber in either a tube or envelope shape***

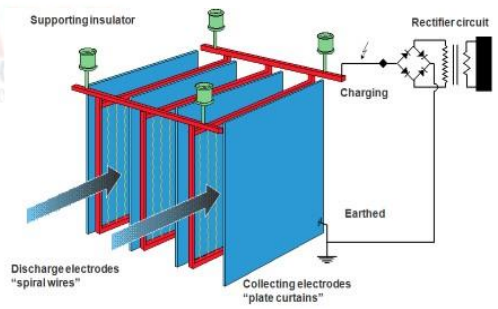
3. Gravity settling chambers

- *Gravity settling reduces the velocity of gas and thus allows the dust particles to settle down.*



4. Electrostatic precipitators

- *They are used to separate the particulate matter by charging them and attracted by electric charge.*
- *It removes particles from a flowing gas using the force of an induced electrostatic charge*



b) **Identify the factors contributing thermal pollution** 5

Causes:

- *Heat producing Industries*
- *Nuclear power plants*
- *Coal fired power plants- thermal plants using coal as fuel*
- *Industrial effluents– electricity generating textile, paper, pulp, sugar release heat in water*
- *Domestic sewage- sewage have high temperature than the receiving water*
- *Urban runoff*

OR

VIII a) **Explain Environmental Impact Assessment (EIA)** 5

- *It can be defined as a formal process used to predict the environmental consequences of any development project.*
- *EIA ensures that the potential problems are foreseen and addressed at an early stage in the project planning and design*

PROCESS OF EIA

- *Screening*
- *Scoping*
- *Assessment and evaluation of impacts and development of alternatives*
- *Reporting the Environmental Impact Statement (EIS) or EIA report*
- *Review of the Environmental Impact Statement (EIS)*
- *Decision-making*
- *Monitoring, compliance, enforcement and environmental auditing .*

b) **Identify the various categories of solid wastes and explain** **10**

- *Solid waste is the unwanted or useless solid materials generated from human activities in residential, industrial or commercial areas.*

- *It may be **categorized** in three ways.*

- *According to its:*

i. *origin (domestic, industrial, commercial, construction or institutional)*
ii. *contents (organic material, glass, metal, plastic paper etc)*
iii. *hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc).*

Types and sources of solid wastes

- *Municipal wastes*
- *Industrial wastes*
- *Hazardous wastes*
- *Mining and quarrying wastes*
- *Energy generation wastes*

MUNICIPAL WASTES

a. Food wastes
b. Rubbish – combustible and non- combustible wastes
c. Ashes and residues
d. Demolition and construction wastes
e. Special wastes- street sweepings, road side litter, drainage debris, dead animals etc.
f. Treatment plant wastes

CAUSES OF SOLID WASTES

i. Commercial establishments
ii. Residential houses
iii. Debris from construction and demolition
iv. Debris from roads (such as asphalt and scrap metal)
v. Scrap from vehicles
vi. Agriculture
vii. Increasing population
viii. Urbanization
ix. Change and advancing technology

UNIT — IV

IX a) Distinct between Hazard and disaster **7**

A hazard is a situation where there is a threat to life, health, environment or property.	A disaster is an event that completely disrupts the normal ways of a community. It brings on human, economical, and environmental losses to the community which the community cannot bear on its own.
Hazard are occurred at the place which has less population	Disasters are mainly occurred at over populated area.
Hazard is caused by negligence	Disaster is a results of differential behavior of nature due to many conditions.
Hazards are natural or manmade phenomenon that are a feature of our planet and cannot be prevented.	These hazards are termed as disasters when they cause widespread destruction of property and human lives.
In their dormant state, hazards just pose a threat to life and property.	Once a hazard becomes active and is no longer just a threat, it becomes a disaster.

b) Explain new and emerging approaches in disaster management 8

Information and Communication Technologies (ICTs) play a significant role in disaster prevention, mitigation response and recovery. Timely, predictable and effective information is much needed by government agencies and other humanitarian actors involved in rescue operations and decision-making processes.

1. Awareness program - If target population are mostly common illiterate people, audio visual aid like Video conferencing, tale- communication even with the experts who are not available at field level can play a great role in educating people to mitigate disaster like situation.
2. Radio & television – The most traditional electronic media used for disaster warning and a widespread effect to the people. The effectiveness of this media in the developing countries and rural environments and there it can be used to spread the warning quickly to a broad population.
3. Telephone/Mobile- The landlines and Cell phones has an important role in warning the communities at stake for an incoming danger of a disaster. A phone call with warning saved many lives in South Asian Countries in 2004 Tsunami mainly at coastal region
4. Short Message Service.(SMS) – the SMS is allowable in most of the cell phone and permits sending of short messages amount the cell phone an even land line. In case of failure of network the SMS can work on a different band and can be sent or received even when phone lines are congested. Other communication technologies are used like Cell broadcasting, satellite radio, internet or e-mail, amateur and community radio, etc. to warn the people at stake in case of a impending disaster.
5. Auto- ALERT through Siren /Emergency bell: People in villages who are not exposed to cell phones etc can be brought under the auto alert systems of sirens or emergency bells which starts on its own whenever any alert message is detected. They can be installed at offices of local administrations or police stations in the locality

- GIS and remote sensing - *Remote Sensing is a measurement of acquisition of information about a phenomenon by a recording device and gathered information about the environment without physical or intimate contact with the object or phenomena*
- *GIS provides the mechanism to centralize and visual display critical information during an emergency.*
- The use of GIS in different phases can be illustrated as follows-
- Planning
- Mitigation

- Preparedness
- Response

OR

X. a) Explain institutional framework of disaster management in national level 8

1. Cabinet Committee on Security (CCS) *– committee consists of Prime minister, minister of defense, minister of Finance, home affairs and external affairs. They oversee all aspects of preparedness, mitigation and management of chemical, biological, radiological and nuclear emergencies or any disaster which has security implications.*

2. National Disaster Management Authority (NDMA):

- *The Disaster Management ACT, 2005 provides for setting up of a National Disaster Management Authority (NDMA) with the Prime Minister as Chairperson. Apart from him there are members whose number shall not exceed nine. One of these can be nominated as Vice-Chairperson of the Authority.*
- *NDMA is responsible for laying down policies, plans and guidelines for disaster management for ensuring timely and effective response to disaster*

b) **Explain the communal based disaster preparedness** **7**

Community-based disaster management (CBDM) is an approach to building the capacity of communities to assess their vulnerability to both human induced and natural hazards and develop strategies and resources necessary to prevent and/or mitigate the impact of identified hazards as well as respond, rehabilitate, and reconstruct following its onset.

➢ Preparedness includes,

1. Preparing hazard zone maps, forecasting and warning.
2. Preparing disaster preparedness plan.
3. Land use zoning.
4. Preparedness through IEC(information, education and communication)

✓ *Mapping is a tool for assessing, storing and conveying information on the geographical location of a disaster (or probable location) and effects (or probable effects) of disasters. Predictability of a disaster is the key to understand its nature and thereby to assess the chances of its occurrence*
✓ *Disaster preparedness plan contains measures to be taken before, during and after the disaster strikes.*
✓ *Land use planning is potentially powerful mitigation tool as it seeks to mitigate the risks and vulnerability from several geological and other hazards.*

- *Preparedness through IEC – Information, education and communication*
- *preparing the community through information means the transfer of basic knowledge by means of facts, figures and processes to the community to increase their awareness*
- *It aims at awakening of the people rather than just awareness.*
- *Communication is the process of information exchange between two or more groups/individuals.*