

Module 1

PART A

(Answer all questions; each question carries 3 marks)

Marks

1 Explain the relevance and adverse effects of greenhouse gases.

3

2 Discuss the two types of monsoon in Indian subcontinent.

3

1

Relevance of Greenhouse Gases (1.5 marks):

Greenhouse gases, such as carbon dioxide (CO₂), methane (CH₄), and water vapor (H₂O), are relevant because they play a crucial role in regulating Earth's temperature by trapping heat from the sun in the atmosphere.

Adverse Effects of Greenhouse Gases (1.5 marks):

The adverse effects of greenhouse gases include global warming, climate change, and rising sea levels. These gases enhance the natural greenhouse effect, leading to higher temperatures on Earth, which can result in more frequent and severe weather events, habitat disruption, and economic challenges.

2

1. South-West Monsoon

- ▶ The south-east trade winds originate from the southern hemisphere in the Indian Ocean. When these winds cross the equator, they get deflected towards the right by the Coriolis force, becoming the south-west trade winds. These winds gather large quantities of moisture as they pass over the Indian Ocean.

2. North-East Monsoon

- The Inter-Tropical Convergent Zone (ITCZ) moves to the south of the equator, when the position of the sun shifts to the southern hemisphere. This leads to the reversal of winds, and the winds start blowing from the north-eastern direction towards the ITCZ. These winds are known as the north-east monsoon winds or the north-east trade winds.

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -I

- 11 a) Categorize the various layers of atmosphere based on their distance from earth and explain the features of each layer with a neat diagram. 8
b) Define the following terms: a) Disaster b) Hazard c) Risk 6

Ans scheme

- 11 a) Diagram with names and distances marked = (1 mark) features of layers of atmosphere-7 marks
b) a) Disaster (2 marks) b) Hazard (2 marks) c) Risk (2 marks)

11a ans(ithrayum ezthanda. Kurach mathi)

ATMOSPHERE

- Based on the temperature, the atmosphere is divided into four parts: (1). Troposphere (2). Stratosphere (3). Mesosphere (4). Thermosphere

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1. Troposphere:

- The bottom dense part, containing 70 per cent of the mass, close to the ground is troposphere. It reaches up to 11 km from the ground.
- Clouds, storms, fog and haze are found only in troposphere.
- The temperature in this layer decreases at about $-6.4^{\circ}\text{C}/\text{km}$ with height. This decrease of temperature with altitude is called lapse rate.
- The border of troposphere is called Tropopause. Tropopause acts like a lid over troposphere. Temperature stops decreasing with height from tropopause.

2. Stratosphere:

- This layer extends to a height of about 50 km from earth's surface.
- Ozonosphere is an important layer found within stratosphere. Ozone (O_3) is found in this layer.
- The temperature increases with height in stratosphere. Due to this, vertical winds seldom occur and only horizontal winds parallel to earth's surface are seen.
- This property leads to absence of turbulence in this layer. This absence of turbulence and clouds ensures good visibility and smooth travel for jet planes
- It is often said that the flying of jet planes in this layer is partly responsible for the destruction of sizable quantities of ozone.
- Above the stratosphere, there is a small layer called Stratopause where temperature neither decreases nor increases with height.

3. Mesosphere:

- The portion of the atmosphere above stratosphere, between 50 km and 80 km is known as mesosphere.
- Though the temperature in mesosphere near stratosphere is higher by about 10° , it falls to -75°C at 80 km.
- The density of air at this height is about $1/1000$ as that of sea level.
- Mesosphere plays a crucial role in radio communication as ionisation occurs here. The sunlight passing through this layer converts individual molecules to charged ions.
- These ionised particles are concentrated as a zone in this layer, which is named D-layer. The D-layer reflects radio waves transmitted from earth.
- Just above the mesosphere is a small layer called Mesopause, where temperature is stable.

4. Thermosphere:

- Thermosphere extends from 80 km to about 60,000 km from earth. Here the temperature increases to about 2000°C .
- Ions are abundant in thermosphere. It is in thermosphere that most of the approaching meteoroids burn up before reaching earth.
- Ionisation takes place in this layer also. Ionisation produces two ionised layers—E and F layers. These layers also have an influence over radio communication as it reflects radio waves.
- In the upper thermosphere, due to higher concentration of ions, it is called Magnetosphere. Thermosphere has no definable upper boundary and it gradually blends with the outer space.



11b

disaster

A sudden occurrence of an accident that causes huge loss of life and property is called as a disaster. It is also called as a calamity.

Types of Disasters

- ▶ **1. Natural Disaster:** A disaster caused by natural factors called as a natural disaster e.g., earthquake, flood, cyclone etc.
- ▶ **2. Man-made disaster:** A disaster caused due to the human activities e.g: wars, fire accidents, industrial accidents etc.

Hazards:

A hazard can be defined as a potentially damaging physical event, social and economic disruption or environmental degradation. Typical examples of hazards can be absence of rain (leading to drought) or the abundance thereof (leading to floods). Chemical manufacturing plants near settlements and incorrect agricultural techniques, can also be seen as hazards which could lead to possible disasters. Hazards can be the creation of man or the environment.

Risk:

There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures.

Module 2

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| 3 | State the major data requirements of hazard mapping and the 3 sources for obtaining these data. | 3 |
| 4 | State the principle of qualitative risk assessment and the method of expressing risk qualitatively. | 3 |

3 ans

Data Requirements of Hazard Mapping:

Spatial characteristics such as location, distribution and dimension; temporal (duration and speed of onset) and magnitude are the major data requirements for hazard mapping. Such information can be obtained through the following sources:

1. Base maps: Base maps represent topographic layers of data such as elevation, roads, water bodies, cultural features and utilities. It must be plan metric, i.e. a representation of information on a plane in true geographic relationship and with measurable horizontal distances.

2. Remotely sensed images: Satellite images are sources of readily available information of locations on the earth's surface compared to conventional ground survey methods of mapping that are labour intensive and time consuming.

3. Field data: Through the advances of technology, ground surveying methods using electronic survey systems like Total Station, the global positioning systems (GPS) and Laser Scanners, have all greatly increased opportunities for data capture in the field.

4ans scheme

4 Principle for qualitative risk assessment (1.5marks) Risk matrix/Risk assessment 3 matrix concept (1.5 marks)

4ans(3marksin ullath mathi)

6.Qualitative methods:

This involves qualitative descriptions or characterization of risk in terms of high, moderate and low. These are used when the hazard information does not allow us to express the probability of occurrence, or it is not possible to estimate the magnitude. This approach has widespread application in the profiling of vulnerability using participatory methodologies. Risk matrices can be constructed to show qualitative risk. A risk matrix shows on its y-axis probability of an event occurring, while on the x-axis potential loss. The probability is described categorically as low, medium and high, while the potential loss is also described similarly.



- 14 a) Explain the four different types of vulnerability. List any four socio-economic indicators of human capital as livelihood asset. 8
- b) Outline the two major physical vulnerability assessment approaches. 6

Answer scheme  noki ezthane. Ithrayum pointsinte aavashyamilla (qno14b)

- 14 a) Four different types of vulnerability(1.5 mark each), Four socio economic indicators -2 marks 8
- b) Empirical & Analytical – (3 marks each) 6

14a

• Types of Vulnerability



• Physical vulnerability

- This refers to the potential losses to physical infrastructure such as roads, bridges, railways, radio and telecommunication mast and other features in the built environment.
- Also includes impacts on the human population in terms of injuries or deaths.

• Social vulnerability

- Social vulnerability refers to losses as experienced by people and their social, economic, and political systems
- Vulnerability refers to the extent to which elements of society such as children, the aged, pregnant and lactating women, single parents, physically and mentally challenged, the poor and destitute, social class, caste, ethnicity, gender, family systems, political systems, economic systems and cultural values degrade after being exposed to a hazardous condition.

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• Economic vulnerability



- This refers to the potential impacts of hazards on economic assets and processes and includes vulnerability of different economic sectors.

• Ecological/environmental vulnerability

- This refers to the degree of loss that an ecosystem will sustain to its structure, function and composition as a result of exposure to a hazardous condition.

Socio economic indicators of human capital

Human Capital

Health

Nutrition

Education

Knowledge and skills

Capacity to work

Capacity to adapt

14b

Group	Method	Description
Empirical Methods	Analysis of observed damage	Based on the collection and analysis of statistics of damage that occurred in recent and historic events. Relating vulnerability to different hazard intensities.
	Expert opinion	Based on asking groups of experts on vulnerability to give their opinions. Eg: the percent damage they expect for different structural types having different intensities of hazard. This is meant to come to a good assessment of the vulnerability. Method is time consuming and subjective. Re-assessments of vulnerability after building upgrading or repair are difficult to accommodate.
	Score Assignment	Method using a questionnaire with different parameters to assess the potential damages in relation to different hazard levels. The score assignment method is easier to update. Eg: if we think about earthquake vulnerability before and after retrofitting.

Page | 9

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Analytical Methods	Simple Analytical Methods	Studying the behaviour of buildings and structures based on engineering design criteria analysing. Eg: seismic load and to derive the likelihood of failure, using computer based methods from geotechnical engg. (shake tables and wind tunnels as well as computer simulation techniques).
	Detailed Analytical Methods	Using complex methods. It is time-consuming, needs a lot of detailed data and will be used for assessment of individual structures.

Table 1. Methods of measuring physical vulnerability