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Date :27.05.2022

**SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF CIVIL ENGINEERING**

**ANSWER KEY**

**18CEO307T – DISASTER MITIGATION AND MANAGEMENT**

**Total – 75 Marks**

**Part-A (25*1=25 Marks)**

1. What is considered to be a major risk for North-eastern states of India
   **A. Flood**
   B. Drought
   C. Cyclone
   D. Frigid-Desert
   ANSWER: A

2. Which of the following disaster is inclusive of a landslide event
   A. Environmental Disaster
   **B. Topographical Disaster**
   C. Meteorological Disaster
   D. Industrial Disaster
   ANSWER: B

3. Identify the data involved in the preparation of Isoseismals
   A. Duration
   B. Location
   C. Magnitude
   **D. Intensity**
   ANSWER: D

4. What is the difference between Epidemic and Pandemic?
   A. Epidemic is a global-scale disaster, and a Pandemic is a local scale disaster
   B. Epidemic is restricted to certain places, and Pandemic related to local scale disaster
   **C. Epidemic is a local scale disaster, and a Pandemic is a global-scale disaster**
   D. Epidemic is related to local scale disasters, and Pandemic is restricted to certain places
   ANSWER: C

5. How is the highest impact of the disaster on society associated with exposure and severity?
    **A. High exposure with high severity resulted in high impact.**
    B. High exposure with moderate severity resulted in high impact.
    C. Moderate exposure with high severity resulted in high impact.
    D. Moderate exposure and severity resulted in high impact.

6. Identify the point within the earth where an earthquake rupture actually starts

    (a) Epicentre (b) Crust

    (c) Fault **(d) Focus**

7. What is the name of the formation of huge revolving storms around the area of low atmospheric pressure in the Atlantic Ocean?

    (a) Typhoon **(b) Hurricane**

    (c) Cyclone (d) Willy-willy

8. Name of the conservation practice used to minimize soil erosion in the agricultural fields

    (a) Percolation ponds (b) Check dams

    (c) Jetty **(d) Contour bunds**

9. Interpret the relationship between the given statements: (A) Sluff avalanches are quite dangerous. Reason (R) Sluff avalanches travel slowly due to friction, which collects debris from the path fairly easily and can pick up speed with ease.

    (a) A is true, R is not the correct explanation

    (b) A is false, but R is the correct explanation

    (c) A is true, and R is the correct explanation

    **(d) A is false, and R is not the correct explanation**

10. How the accurate location of the epicenter of an earthquake is identified

    (a) Remote Sensing (b) Survey

    (c) Isoseismals **(d) Time-travel curve**

11. What was the primary cause of the Nuclear Disaster in Fukushima on 11$^{th}$ March 2011?

    **(a) Earthquake and Tsunami**

    (b) Low-quality reactors

    (c) Malfunction of cooling systems

    (d) Internal fire accident

12. What is the name of the outbreak of diseases or contagions of plant and animal life on a pandemic level

    (a) Nuclear disaster (b) Chemical disaster

    **(c) Biological disaster** (d) Forest fire

13. What type of fire is particularly very dangerous?

    A. Surface fire **B. Crown fire on a hill slope**

    C. Crown fire on a flat surface D. Surface fire in the dry region

    ANSWER: B

14. Interpret the relationship between the given statements: Assertion (A) The method of simultaneous integration of crops is called crop rotation. Reason (R) This practice is done to decrease the rate of soil erosion.

    **(a) A is true, but R is not the correct explanation**

    (b) A is false, but R is the correct explanation

    (c) A is true, and R is the correction explanation

    (d) A is false, and R is not the correction explanation

15. What is the issue of the Jharia coal mine underground fire?

    (a) Forest fires

    (b) Lightening

    (c) Human accident

    **(d) Unscientific mining and extraction of coal in the past**

16. What is the name of a map in which the areas are classified based on the natural surface features on the ground

    **A. Land cover map**

    B. Land-use map

    C. Land cover and Land-use map

    D. Cadastral Map

17. Which among the following does not come under preparing multiple hazard maps
    A. Translated Information
    B. Sources and Compiling Information
    C. Timing
    **D. EWS**

18. What is the method used to rescue a sling in which a person may be lowered from heights?

    A. Lashing
    B. Double sheet-bend
    **C. Chair-knot**
    D. Fore and Aft Method

19. Interpret the relationship between the given statements: Assertion (A) SAR stands for Search and Respond (SAR). Reason (R) The SAR activities are undertaken in two ways i) Community Local Rescuers and ii) Outside Community Resources.
    A. A is true, but R is not the correct explanation
    **B. A is false, but R is the correct explanation**
    C. A is true, and but R is the correct explanation
    D. A is false, and R is not the correct explanation

20. Interpret the relationship between the given statements: Assertion (A) Land use and Land cover classification are considered important in disaster prevention and mitigation for disaster-prone regions (R) The information on Land use is given high priority than Land cover in decision making.
    **A. A is true, but R is not the correct explanation**
    B. A is false, but R is the correct explanation
    C. A is true, and R is the correct explanation
    D. A is false, and R is not the correct explanation

21. Name the satellite used for weather forecasting, and cyclone prediction in India
    **A. SCATSAT-1**
    B. AVHRR
    C. RISAT
    D. Landsat
22. What is the rank of the “Ruinous” category in MMI SCALE?
    A. 3
    B. 5
    **C. 9**
    D. 11
23. What is the name of the regional navigation satellite system developed by India?

    A. RISAT **B. IRNSS**

    C. GPS D. GLONASS

24. What sensor-platform characteristic is closely associated with the changes that occurred overtime
    A. Spatial Resolution B. Radiometric resolution
    C. Spectral Resolution **D. Temporal resolution**

25. Interpret the relationship between the given statements: Assertion (A) The control segment controls the GPS Satellites by tracking and providing them with correct orbital and clock information. Reason (R) The control segment maintains two-way transmission with the user and space segment.

**A. A is true, but R is not the correct explanation**

B. A is false, but R is the correct explanation

C. A is true, and R is the correct explanation

D. A is false, and R is not the correct explanation

## Part B (5*10=50 Marks)

26. a. Demonstrate the purpose, key stages and outcomes of the Disaster management cycle.


1. Preparedness: Measures enabling govt orgs, communities and individuals to respond rapidly and effectively to disaster situations.

2. Response: Measures taken immediately prior to and following disaster impact.

3. Recovery: Process by which communities and the nation are assisted in returning to their proper level of functioning.

4. Mitigation: Measures aim to reduce the impact of a natural or man-made disaster on a nation or community.

**Stages of Disaster Management Cycle**

The cycle generally comprises four major stages:

1. Disaster Prevention, Preparedness and Mitigation

2. Disaster Response and Immediate Relief

3. Disaster Rehabilitation, Reconstruction and Recovery

4. Long-term Development

**- (7 marks)**

**Outcomes of the DM**

Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle.

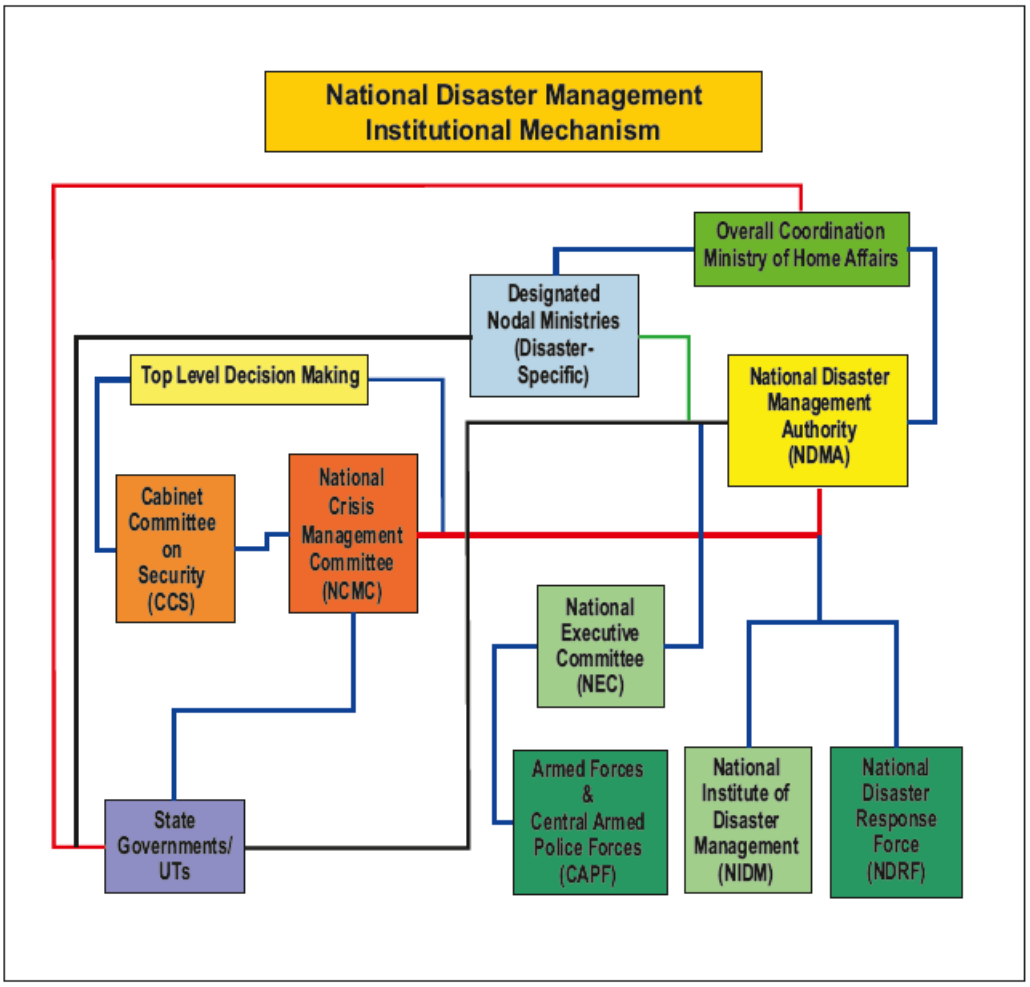
The shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

**- (3 marks)**

(Or)

b. National Disaster Management Frame work structure




**(10 Marks)**

**27. a.**

**i) Earthquake causes effects and classification:**

An **earthquake** (also known as a **quake**, **tremor** or **temblor**) is the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves. Earthquakes can range in intensity, from those that are so weak that they cannot be felt, to those violent enough to propel objects and people into the air and wreak destruction across entire cities. The seismicity, or **seismic activity**, of an area is the frequency, type, and size of earthquakes experienced over a particular time period.

**Causes of earthquake:**

**1. Natural** - Tectonic Plate, Volcano

**2. Artificial** - Bore wells, bomb blast, mining

**Elastic Rebound Theory, Faults, Seismic Waves, Magnitude and Intensity**

**Classification:**

**Inter Plate**

Most earthquakes in the world occur along the boundaries of the tectonic plates

**Intra Plate**

A number of earthquakes also occur within the plate itself but away from the plate boundaries

Earthquakes usually occur at some depth below the ground Surface. The depth can also be calculated from seismograph records.

**Earthquake foci are described as:**

Shallow: less than 70 km depth

Intermediate: 70 - 300 km depth

Deep: 300 - 700 km depth

90% of earthquake foci are less than 100 km deep

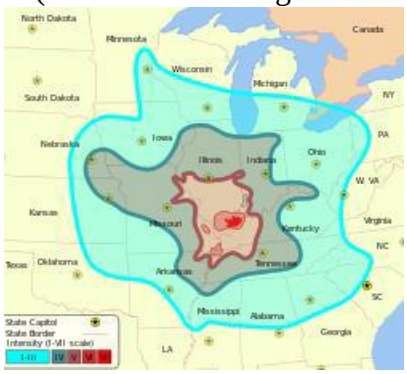
Large earthquakes are mostly at < 60 km depth

No earthquakes occur deeper than 700 km - (6 marks)

**ii) Isoseismals:**

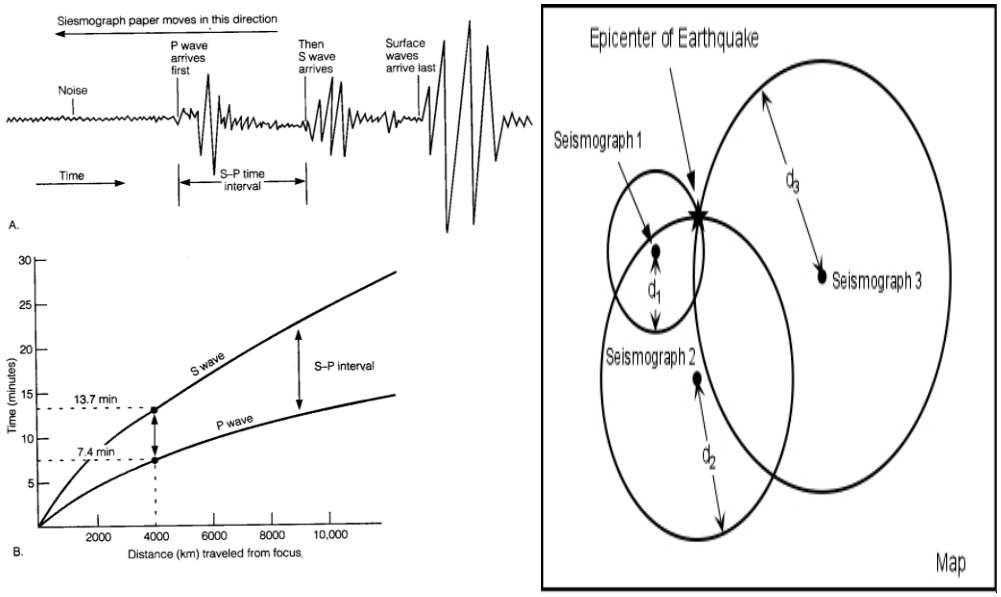
- **Hypothetical** lines –Same Intensity
- A line joining all the similar intensity points are known as Isoseismals.
- Isothermal Records.
- Factors controlling Isoseismals

Nature of Shocks–Shallow origin give rise to high Isoseismals; Deep origin produce moderate Isoseismals.
Nature of Rocks –Uniform nature (Isoseismalsis regular and circular) -Structural and lithological variations (Isoseismals is irregular and elliptical in shape




- (2 Marks)

iii) s-p travel time curve in locating Epicentre




- (2 Marks)

(Or)

**b. Land slide**

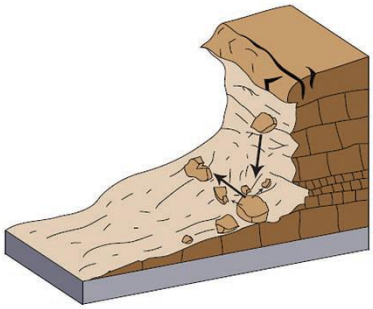
Landslide is a general term used to describe the downslope movement of soil, rock, and organic materials under the effects of gravity and also the landform that results from such movement.

A landslide is a downslope movement of rock or soil, or both, occurring on the surface of rupture—either curved (rotational slide) or planar (translational slide) rupture—in which much of the material often moves as a coherent or semi coherent mass with little internal deformation. It should be noted that, in some cases, landslides may also involve other types of movement, either at the inception of the failure or later, if properties change as the displaced material moves downslope.

**Landslides can be classified into different types** on the basis of the type of movement and the type of material involved. In brief, material in a landslide mass is either ***rock*** or ***soil*** (or both); the latter is described as ***earth*** if mainly composed of sand-sized or finer particles and ***debris*** if composed of coarser fragments. The type of movement describes the actual internal mechanics of how the landslide mass is displaced: ***fall***, ***topple, slide, spread,*** or ***flow.***

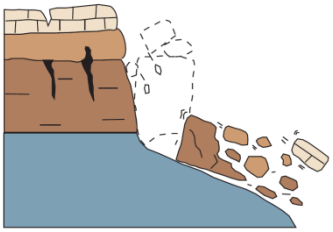
## Falls

A fall begins with the detachment of soil or rock, or both, from a steep slope along a surface on which little or no shear displacement has occurred. The material subsequently descends mainly by falling, bouncing, or rolling.



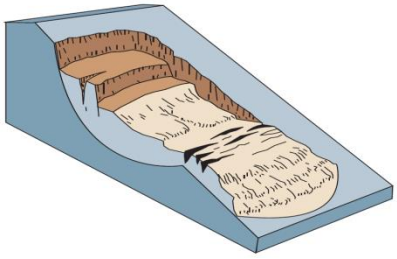
## Topple

A topple is recognized as the forward *rotation* out of a slope of a mass of soil or rock around a point or *axis* below the *center of gravity* of the displaced mass. Toppling is sometimes driven by gravity exerted by the weight of material upslope from the displaced mass. Sometimes toppling is due to water or ice in cracks in the mass. Topples can consist of rock, debris (coarse material), or earth materials (fine-grained material). Topples can be complex and composite.



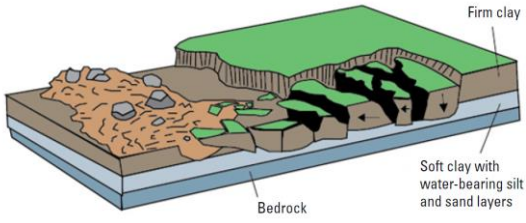
## Slides

A slide is a downslope movement of a soil or rock mass occurring on surfaces of rupture or on relatively thin zones of intense shear strain. Movement does not initially occur simultaneously over the whole of what eventually becomes the surface of rupture; the volume of displacing material enlarges from an area of local failure.



## Spreads

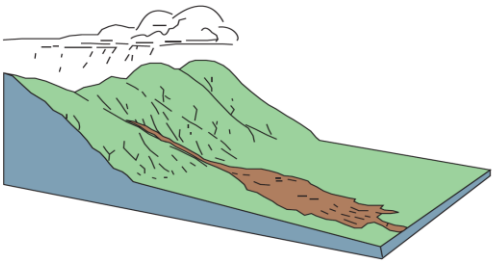
An extension of a cohesive soil or rock mass combined with the general subsidence of the fractured mass of cohesive material into softer underlying material. Spreads may result from liquefaction or flow (and extrusion) of the softer underlying material. Types of spreads include block spreads, liquefaction spreads, and lateral spreads.




## Flows

A flow is a spatially continuous movement in which the surfaces of shear are

short-lived, closely spaced, and usually not preserved. The component velocities in the displacing mass of a flow resemble those in a viscous liquid. Often, there is a gradation of change from slides to flows, depending on the water content, mobility, and evolution of the movement.



- **( 7 Marks)**

**Mitigation:**

**Excavation**
Backfilling with lightweight material
**Strengthening Slopes -** Plastic mesh reinforcement, Rock-fill buttresses, Check Dams.
**Drainage Techniques - Drainage Techniques,** Drainpipes Straw wattles and straw bales
Retaining Walls
Reinforced earth wall

- **(3 Marks)**

**28. a. Chernobyl disaster**

**Chernobyl disaster**, accident in 1986 at the Chernobyl nuclear power station in the Soviet Union, the worst disaster in the history of nuclear power generation. The Chernobyl power station was situated at the settlement of Pryp'yat, 10 miles (16 km) northwest of the city of Chernobyl (Ukrainian: Chornobyl ) and 65 miles (104 km) north of Kyiv, Ukraine. The station consisted of four reactors, each capable of producing 1,000 megawatts of electric power.

The Chernobyl disaster occurred when technicians at nuclear reactor Unit 4 attempted a poorly designed experiment. They shut down the reactor's power-regulating system and its emergency safety systems, and they removed control rods from its core while allowing the reactor to run at 7 percent power. These mistakes, compounded by others, led to an uncontrolled chain reaction that resulted in several massive explosions.
Explosions of the Chernobyl disaster, whereas others report that the figure was closer to 50. Dozens more contracted serious radiation sickness; some of these people later died. In addition, thousands of deaths from radiation-induced illnesses and cancer were expected years later.

As a result of the Chernobyl disaster, the Soviet Union created an exclusion zone with a radius of about 18.6 miles (30 km) centered on the nuclear power plant, covering 1,017 square miles (2,634 square km) around the plant. The zone was later expanded to 1,600 square miles (4,143 square km) to include heavily radiated areas outside the initial zone. The Chernobyl disaster caused serious radiation sickness and contamination. Between 50 and 185 million curies of radionuclides escaped into the atmosphere. Millions of acres of forest and farmland were contaminated, livestock was born deformed, and humans suffered long-term negative health effects.

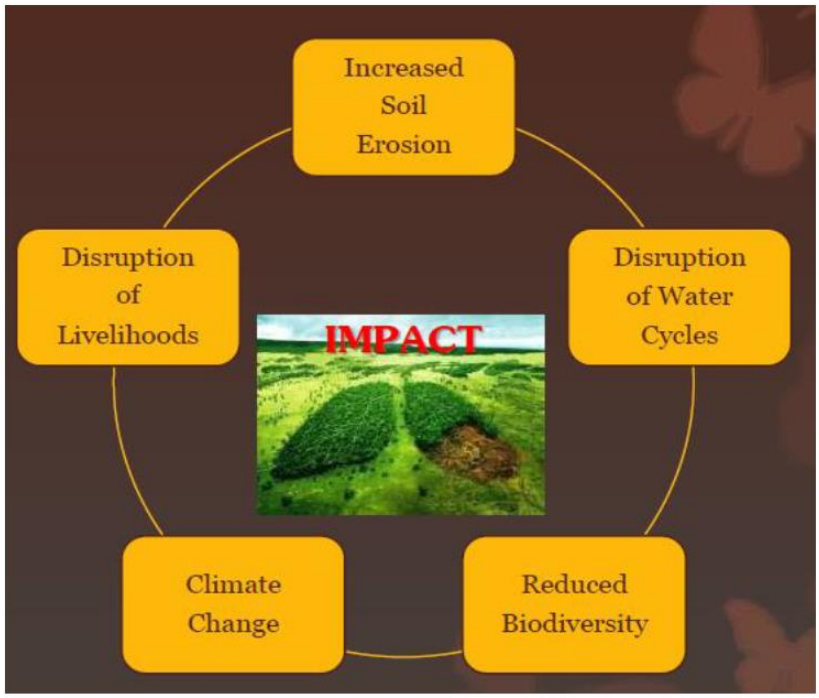
**- (10 Marks)**

(Or)

**b. Environment and Economic Impacts of Deforestation**

Deforestation is when humans remove or clear large areas of forest lands and related ecosystems for non-forest use. These include clearing for farming purposes, ranching and urban use. In these cases, trees are never re-planted.

**Environmental & Economic Impacts**




**Short Term Environmental Effects:**

Increased soil erosion
Disruption of water cycle

**Long term environmental effects:**

Reduced biodiversity
Climate change
Economic effects
Disruption of livelihoods

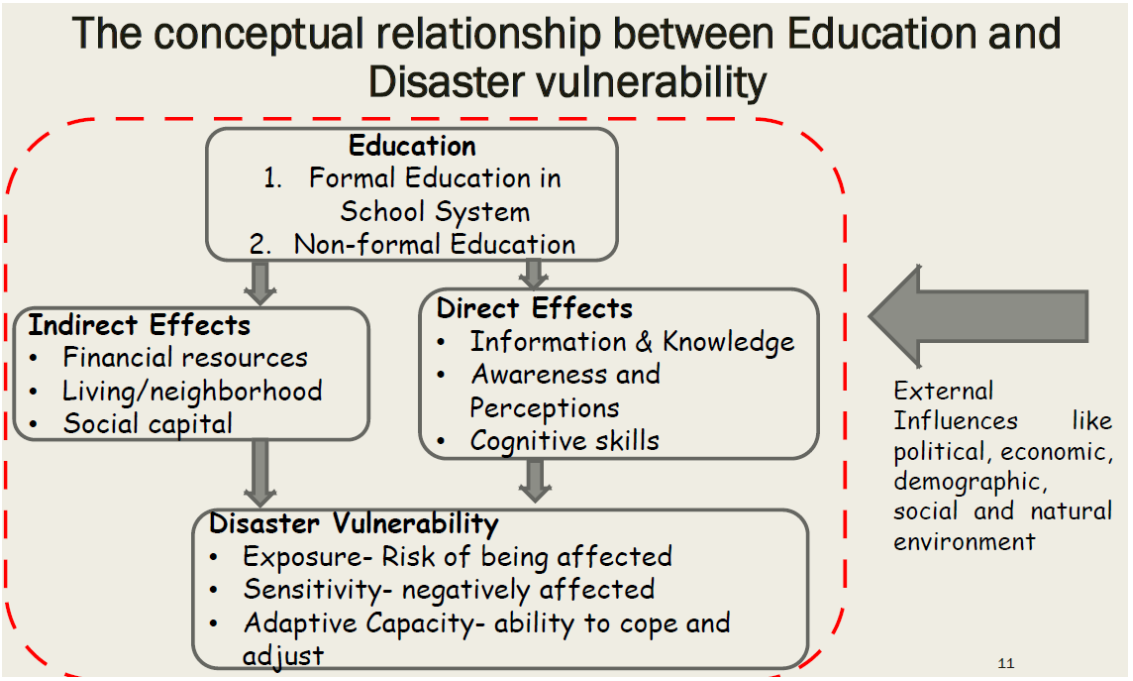
**Economic Effects:**

Deforestation greatly influences many lives

In Southeast Asia deforestation contributed to migration and social conflicts.
In Brazil the poor people are constantly pressured to move from their villages often to remote soy plantations where they have to work under inhumane conditions.
Destroying the sources of medicine.
Increasing the food insecurity.

**(10 Marks)**

**29.a. Conceptual relation between Education and Vulnerability**




**(10 Marks)**

**(Or)**

**b. Search and Rescue (SAR)**

Termed as "helpful behaviour in emergencies".
Search and rescue is a technical activity rendered by a group of specially trained personnel.
1. Community Local Rescuers
2. Outside Community Resources

**Objectives of SAR:**
■To rescue the survivor strapped under the debris, from the damaged buildings or from a cyclonic storm surge, flood, earthquake and fire.
■To provide First Aid services to the trapped survivors and to dispatch them for medical care.

■To take immediate necessary actions, as necessary, for temporary support and protection to endangered collapsed buildings to structures.
■To hand-over, recover and dispose-off the bodies of the deceased.
■To train, demonstrate and raise awareness on how to use the local materials for self-rescue among the community people.

**Duties of the Rescuer**

1. Assessment
2. Information
3. Observation –LLF –Look, Listen and Feel

**Rescue Stages**

■Stage 1 -Surface Causality (Emergency Rescue)
■Stage 2-Search in Slightly Damaged Buildings (Immediate Rescue)
■Stage 3-Search of Possible Survival Points (Specialised Rescue)
■Stage 4 -Selected Debris Clearance (Specialised Rescue)
■Stage 5 -General Debris Clearance (Specialised Rescue)

**(10 Marks)**

**30. a.**

**Landslide-Remote Sensing based Simulation**

•It is expected that in future the Very High Resolution (VHR) imagery, such as from IKONOS-2, might be used successfully for landslide inventory.
•Multispectral imagery –vegetation, lithology and land use.
•Stereo SPOT imagery is used in geomorphological mapping, or terrain classification.
•Digital elevation models can be derived from SPOT or IRS images, or using airborne or space borne **InSAR** techniques.
•In the phase of disaster preparedness use could be made of the following techniques for the monitoring of landslide movements: ground measurements, photogrammetry, GPS, **Radar interferometry**.

| DISASTER | MITIGATION | PREPAREDNESS | RECOVERY | RESCUE | SATELLITES USED |
|---|---|---|---|---|---|
| LANDSLIDE | Risk modelling; hazard mapping; digital elevation models. | Monitoring rainfall and slope stability. | Mapping affected areas; | Damage assessment; spatial planning; suggesting management practices. | PALSAR; IKONOS 2; InSAR; SPOT; IRS |

29

**(10 Marks)**

**(Or)**

**b. National Institute of Hydrology, India**

**Introduction**

NIH- working in the area of hydrology and water resources.

It was founded on 16December, 1978 as an autonomous body under the Ministry of Irrigation (now renamed as Ministry of Water Resources, River Development & Ganga Rejuvenation), Government of India at Roorkee.

The research activities of the Institute are being carried out in six scientific divisions at the headquarters at Roorkee, two Centres for Flood Management Studies at Guwahati and Patna and four Regional Centres at Belagavi, Jammu, Kakinada and Bhopal.

The Institute's research and other technical activities are monitored and guided by the Technical Advisory Committee, Working Group (for headquarter) and Regional Coordination Committees (for Regional Centres and Centres for Flood Management Studies.

**Objectives**

■To undertake aid, promote and coordinate systematic and scientific work in all aspects of hydrology.

■To cooperate and collaborate with other national and international organizations in the field of hydrology

■To establish and maintain a research and reference library in pursuance of the objectives of the Society and equip the same with books, reviews, magazines and other relevant publications.

**R & D Activities**

- ■Climate change on water resources
- ■Integrated water resources management
- ■Groundwater modelling and management
- ■Flood and drought management
- ■Regional hydrology
- ■Hydrology of extremes
- ■Reservoir/lake sedimentation
- ■Watershed hydrology
- ■Water quality assessment in specific areas.

**Scientific Divisions at Roorkee**

- ■Environmental Hydrology
- ■Ground Water Hydrology
- ■Hydrological Investigations
- ■Surface Water Hydrology
- ■Water Resources Systems
- ■Research Management and Outreach Division (RMOD)

**- (10 Marks)**