NOTES FOR STUDIES

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Earthquake :-

Earthquakes are defined as, 'Ground shaking and radiates seismic energy caused mostly by sudden slip on a fault, volcanic or any sudden stress changes in the earth.

The science dealing with the study of earthquakes in all their aspects is called Seismology. It is an interdisciplinary science which is partly geology & partly physics. The word seismic is commonly used to qualify anything related to an earthquake, such as seismic waves, seismic intensity, seismic zoning, seismic region & so on.

An earthquake is generally due to some disturbance or displacement in the rocks at some depth below the surface of the earth. Shock waves originate from the place or point of disturbance & then travel in all direction causing the vibrations. The place or point of origin of an earthquake below the surface of earth is termed as its focus or Hypocentre.

→ Magnitude :- It is the term expressing the rating of an earthquakes on the basis of amplitude of seismic waves recorded as seismograms.

→ Intensity - It is the rating of the effects of an earthquake at a particulars place based on the observations of affected area

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Causes of Earthquakes :—

Earthquakes are primarily caused due to two reasons.

① Natural Disturbances
② Artificial Disturbances.

Natural Disturbance :—

The Natural disturbances which causes earthquakes are following.

ⓐ Volcanic Causes :— Volcanic activities keeps on taking place in several parts of the world very often, it produces sudden out burst or explosions. This impact is sometimes strong enough to produce vibrations in the nearby areas. These earthquakes are not very deep & of mild intensity. The damage caused due to this type of earthquakes is confined within a few kilometers. All volcanic eruptions don't produce Earthquakes

ⓑ Tectonic Causes :— Tectonic causes are those which occur inside the earth. According to the theory of plate tectonics, the Crust is made up of rocks & is divided into many plates. These plates are constanly in motion in different direction & with different speed. These rocks or plates have strain energy stored in them.

The earthquake which occur due to sudden release of strain energy as a result of sudden slip of fault is called as Tectonic Earthquakes. More than 90% of total earthquakes are because of tectonic reasons.

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Artificial Disturbance :—

Sometimes the surface of the earth vibrates due to man made or artificial disturbance. These vibrations are very mild & affect the surrounding area only. The earthquake of mild intensity are caused due to these external man made agencies.

Some of the artificial disturbance causing earthquakes are listed below.

(a) Nuclear tests & explosions.
(b) Mining blasts
(c) Massive landslides because of deforestation.
(d) Large & deep excavations.
(e) Vibrations Induced due to heavy machinery used in Industries or movement of heavy vehicles.

The vibrations or shaking caused due to above reasons is very mild & limited to small areas only. All these causes occur over the earth's surface so these are also called as surface causes.

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Flood :-

A Flood is an overflow of water that submerges land that is usually dry. In the sense of 'flowing water', the word may also be applied to the inflow of the tides.

Flooding may occur as an overflow of water from water bodies, such as a river, lake or ocean, in which the water overtops or breaks ~~leave~~ levees, resulting in some of the water escaping its usual boundaries, may occur due to an accumulation of rainwater on saturated ground in an areal flood.

Floods can also occurs in rivers. when the flow rate exceeds the capacity of river channel, particularly at bends or meanders in the waterways. floods often cause damage to homes & business if they are in the natural flood plains of rivers.

Some floods develop slowly, while other such as flash floods, can develop in just a few minutes & without visible sign of rain. Additionally floods can be local, impacting a neighborhood or community, or very large, affecting entire river basins.

Frequency analysis is one of the main techniques used to defined the relation between the magnitude of an event and the frequency with which that event is exceeded.

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Flood Frequency Analysis (FFA):—

It is used for estimating flood peak quantities for a set of non-exceedance probabilities. It involves the fitting of a probability model to the sample of annual flood peaks recorded over a period of observation, for a catchment of a given region. The model parameters established can then be used to predicts the extreme events of large recurrence interval.

Reliable flood frequency estimates are ideal for flood plain management, to protect the public, minimize flood related costs to government & private enterprises for designing & locating hydraulic structures & assessing hazards related to the development of flood plains.

Flood Routing:—

It is the technique of determining the flood hydrograph at a section of a river by utilizing the data of flood flow at one or more upstream sections. The hydrologic analysis of problems such as forcasting, flood protection, reservoir design & spillway design invariably include flood routing.

In these application two broad categories of routing can be recognized. These are.

1. Reservoir routing
2. Channel routing.

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A variety of routing methods are available & they can be broadly classified into two categories

(a) Hydrologic routing / Lumped - Flow is calculated as a function of time along at a particular location Hydrologic routing method employ essentially the equation of continuity & water flow/storage relationship

(b) Hydraulic routing / Distributed - Flow is calculated as a function of space and time throughout the system. Hydraulic method use continuity & momentum equation along with the equation of motion of unsteady flow.

Hydrologic routing method employ the equation of continuity. Hydraulic method, on the other hand, employ the continuity equation together with the equation of motion of unsteady.

Types of Flood Routing :-

(a) Lumped / Hydrologic

Flow → f (time)
Continuity equation & flow / storage relationship

(b) Distributed / Hydraulic

Flow → f (space, time)
Continuity & Momentum equations.

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fire :—

It is a form of chemical reaction that involves the rapid oxidation of combustible fuel (material) with the subsequent liberation of heat & light.

Types of fire :—

As far as safety is concerned, there are two types of fire.

(a) Controlled (safe) fire :—

→ There is good control on size, duration, temprature, smoke & fumes of fire.

→ These are used in our daily life such as cooking, heating (by gas, coal or kerosene) car, aeroplane & rocket engine.

→ It requires the presence of air (oxygen) fuel & heat (ignition toure)

→ These components are termed the fire-triangle.

(b) Uncontrolled (Dangerous) fire :—

→ There is no control on size, duration, temprature, smoke & fumes of fire.

→ These type of fire occur due to accidental (or due to criminal act) spread of fire to catch combustible material.

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→ In addetion to oxygen, fuel & heat, the type of fire require uninhibited chain reaction

→ In a uninhibited chain reaction burning continues & may even accelarate.

→ The chain reation occurs due to the breakdown & recombination of the molecules that will add to fuel of fire.

Effects of Uncntrlled fire :-
→ Human loss : burning from extreme heat : suffocation from smoke & fumes
→ Structural damage : Damage to labs, office & building
→ Material damage : Damage to instrument, equipments, furniture & supplies.
→ Disruption of work
→ Financial loss.

Fire Safety Equipments & Devices
→ Smoke & Heat detector (usually in the ceiling)
→ Fire & Emergy alarm
→ Fire & Emergeny light
→ Water sprinklers
→ Fire extinguishers
→ Fire blanket
→ Emergeny exist sign & lights.
→ Fire & Emergeny exits.

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Classes of fire :—

1. Class A → Ordinary Combustibles (wood, papers, rubber, fibers & plastics)
2. Class B → Flammable liquid & gases (gasoline, oils, paints, lacquers & tar)
3. Class C → fires involving live electrical equipment
4. Class D → Combustible metal or Combustible metal Alloys.
5. Class K → fires in cooking appliances that involve Combustible cooking media.

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Cyclones :—

A cyclone is a huge strong wind system which blows around the centre of intense low pressure area. Cyclone are the local name of the Indian ocean & South pacific ocean, but in the North west Pacific ocean they are known as typhoons & in the North east Pacific & North Atlantic they are known as Hurricanes.

Since the cyclones form in the tropical region, they are also known as tropical storms, tropical revolving storms or tropical cyclones. In the northern hemisphere, cyclone winds blow anticlockwise & they reverse in the southern hemisphere.

Formation of Cyclone :—

Cyclones develop over warm seas near the equator. Air heated by the sun rises swiftly, which creates areas of very low pressure. As the warm air rises, it becomes loaded with moisture which condenses into massive thunder clouds.

Surrounding air rushes in to fill the void that is left. But because of constant turning of the earth on its axes, the air is bent inwards & then spiral upwards. The swirling wind rotates faster & faster, forming a huge circle. At the centre of the storm is a calm, cloudless area called the eye - where there is no rain & the winds are fairly light.

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The development of cycle of Tropical Cyclones can be divided into three stages.

→ Formation & Initial development
→ Full maturity
→ Decay.

① Formation & Initial development :-

Four atmospheric & oceanic conditions are necessary for the development of a cyclonic storm

→ A warm sea temperature in excess of 26°C to a depth of 60 m which provides abundant water vapour in the air by evaporation

→ High relative humidity of the atmosphere to a height of above 7000 m facilitates condensation of water vapour into the water droplets & clouds, release heat energy thereby following a drop in pressure.

→ Atmospheric instability encourages formation of massive vertical cumulus cloud convention with condensation of rising air over ocean.

→ A location of at least 4-5 latitude degree from the equator allows the influence of the forces due to the earth's rotation to take effect in wind circulation around low pressure centers.

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② Full Maturity :—

If the ocean & atmospheric environment continues to be favourable the cyclone may continue to intensify as it moves pole-ward. The cloud system become more circular in shape & develop a distinct eye. This is the shape which signifies the cyclone is at its most severe & dangerous stages. Approximately half of the cyclones of this form progress of full maturity.

⑤ Decay :—

A tropical cyclone begins to dissipate when the central pressure becomes filled up. The storm eye become distorted. High wind becomes weak. Severe weather moderate. When the cyclone hits land, storm wind & storm surge may occur near the coastline & heavy rain & flood may occur along the storm track in land.

Hazards associated with cyclones :-

There are three hazards associated with a cyclone which cause destruction.

① Storm Surge :—

A storm surge is an abnormal rise of sea level near the coast caused by a severe tropical cyclone as a result sea water inundates low lying areas of coastal region drowning human beings & livestock eroding agricultural land, beaches & embankments, destroying vegetation & reducing soil fertility.

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② Strong Wind :-

The most destructive force of a cyclone comes from fierce winds. These winds are strong enough to easily topple fences, sheds, trees, power poles & communication system, while hurling helpless people through the air.

Many people are killed when the cyclone wind cause buildings & houses to collapse & completely blow away resulting in loss of life & property.

③ Flood :-

Heavy & prolonged rains due to cyclones may cause floods & submergence of low lying areas causing loss of life & property. Floods & coastal inundation due to storm surges pollute drinking water sources causing outbreak of epidemics.

Long after a cyclone has passed, road & rail transport can still be blocked by flood waters. Water often becomes contaminated from dead animal or rotten food & people are threatened with deseases like diarrhoea & other infections.

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Mitigation Measures :—

Mitigation means measures takes prior to the impact of a disaster to minimize its effects. Mitigation measures for cyclone include both structural & non-structural measures. These measures needs government intervention as well as community participation.

Some of the measures, especially legislation itself but need the government intervention & initiative. These community mitigation activities can be achieved with the support from government & other civil society.

(1) Hazard mapping :—

It represent the result of cyclone hazard assesment on a map, showing the frequency / probability of occouance of various intensities or durations. Cyclone cannot be predicted several day in advance. Past records & paths can give the pattern of occouance for particular wind speeds.

A Hazard map will illustrate the areas vulnerable to the cyclone & associated storm surge & flood in any given time. It will be usefull to estimate the severity of the cyclone & potential damage intensities in the region.

(2) Land use planning :—

Land use planning should be systematically considered for cyclones so that least critical activities are placed vulnerable area. Location of settalments in the flood plains is of outmost risk. Siting of key facilities must be marked in the land use.

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