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QUESTION 1

EARTHQUAKE

- An earthquake is the sudden movement of the Earth tectonic plates resulting in shaking of the ground-
- Earthquakes are measured using observations from seismographs-
- The magnitude & intensity of shaking is measured usually on Richter scale

Necessary Measures

- 1- Building capacity of relevant institutions for disaster risk management-
- 2- Conduct awareness raising programs-
- 3- Implement school safety programme-
- 4- Effective implementation of building codes, building by laws and promotion of seismic retrofitting of earthquake damaged buildings-
- 5- Strengthen emergency response capability-
- 6- Develop a system for regular updating of relevant data, earthquake risk studies-

- 7- Investing in disaster risk reduction for resilience-
- 8- Enhancing disaster preparedness for effective response to 'build back better' in recovery, rehabilitation and reconstruction-
- 9- Mitigation should be occur, which is the social attempt to reduce occurrence of any disaster like (earthquake, flood, draught etc)
- 10- Incorporate disaster risk reduction issues into school curriculum-

QUESTION 2

Part (A)

SEISMOLOGY

Seismology is the study of earthquakes and seismic waves that move through and around the earth-

History of Seismology

- Every day there are about 50 earthquakes strong enough to be felt locally several of these produce distant seismic waves-
- Seismology is a young science only about 150 years old

Early 1800s

- Theory of elastic wave propagation in solid materials is developed by Cauchy, Poisson, Stokes and others-
- They describe primary and secondary body waves and surface waves

1857

- R. Mallet, an Irish engineer travels to Italy to study damage caused by earthquake
- His contributions:
 - earthquake waves radiate from a central focus
 - Observatories should be established to monitor earthquakes-

1897

- First seismograph in North America was installed at Lick Observatory.
- This instrument will later record the 1906 San Francisco earthquake.

Early 1900s

- B.B. Galitzin develops the first electromagnetic seismograph in which a moving pendulum generates electric current in a coil and establishes a network of seismic stations across Russia.

1900 - 1910

- Seismograms from many earthquakes recorded at many distances.
- R. Oldham identifies P-S and surface waves in earthquake records.
- First widely used travel time tables are published by Zoppitz-

1920s

- Seismic surveying methods using explosions and other artificial sources are developed in United States for exploring for oil and other resources.
- Noise-reducing trace stacking methods and Vibroseis are developed in

1950s-

1940

- H. Jeffries and K. Bullen publish final versions of their travel time tables for many seismic phases - They are accurate enough to still be in use today.

1950s and 1960s

- Soviet nuclear tests in early 1950s generate intense interest by US military in detection and measurement of nuclear explosions.
- Worldwide standardized seismograph network consist of well calibrated short & long period seismographs is established in 1961.
- Application of computers to larger datasets and problems begins in 1960s-

1970s

- First digital global seismographs installed-
- First digital portable seismographs used for special studies-
- Centralised archives of digital seismic data established-

Part (b)

Seismoscope :-

It is an instrument that gives a qualitative measure of oscillatory motion produced by an earthquake or other disturbance of earth surface.

Working Principle

It works on the principle of pendulum, a heavy, inert mass with certain resistance to movement due to its weight suspended from frame by a spring that allows movement.

Modern seismoscope record the movement of earthquake digitally.

Typically large mass and low spring stiffness is used.

To record ground motion seismoscope must be decoupled from the ground.

If seismoscope moves with ground then no motion will be recorded.

QUESTION 3

Disaster risk of Pakistan

- A disaster is any event, natural or man caused which create an intense negative impact on people, goods and services and also environment.
- The disaster risk is the probability of meeting danger or suffering harm and loss.

Disaster risk

- In October 2005 earthquake highlighted the risk exposure and vulnerability of Pakistan.
- The decision makers, politicians and media and international donors have become aware for the first time of the major catastrophic risks facing Pakistan.
- many natural hazards including earthquake, flood and droughts etc has threatened Pakistan.

Climate change

- Also the variety of human induced hazards like industrial, nuclear and transport accidents has threaten the economy of Pakistan-
- Pakistan exposure to disasters and natural hazards could be ranked between moderate to severe-
- Earthquakes:- Pakistan lies within a seismic belt and therefore suffers from frequent small & medium magnitude earthquake-
- Commonly occur along Himalayas & Karakorum range -
- Cyclones:- According to World disaster report 2003 960 km long coastal belt of Pakistan is occasionally battered by cyclones-
- Floods:- Pakistan is one of the five South Asian countries physically effected by floods-

QUESTION 4

Environmental vulnerability

- Vulnerability is human dimension of disasters and is the result of
- range of economic, social, cultural and political factors that shape people lives and environment that they live in
- Environmental vulnerability increase the susceptibility of community to impact of hazards.
- It is one of the defining components of disaster risk.
- Levels of vulnerability help to explain why some non extreme hazards can lead to extreme impacts and disasters while some extreme events do not.
- Assessing the vulnerability of the built environment to hazards is extremely important in

assessing potential consequences of an event and for mainstreaming disaster risk reduction into local development planning process -

- Understanding the response of existing structures to potential hazards such as ground shaking from earthquake and wind from tropical cyclones, requires the knowledge of building materials and engineering practices -
- In order to make informed policies strategies and programs on disaster risk management a vulnerability atlas will be prepared -
- environmental vulnerability relates to number of factors i.e. - poor environmental management, over consumption of natural resources, decline in risk regulating ecosystem, services, climate change etc -