



Banha University
 Faculty of Science
 Geology Department
 Geophysics Branch-3rd Year

Note: Answer of Examination is in Four pages.

Date: Tuesday, 21/05/2019
Final Exam. Of Earthquake
(G 350)
Time: 120 Minutes (1-3 Pm)

Answer the following questions (48 marks)

I- How "Almost 95 % of earthquakes take place in seismic belts corresponding to plate boundaries" Discuss.

Crust and a portion of the upper mantle are together termed as the lithosphere (from the Greek word lithos for stone). This layer appears on the surface as land masses called continents. Satellite observations confirm that the brittle lithosphere is fragmented into several large land masses called plates fitting together.

Earthquakes can be caused by various reasons such as tectonic, volcanic, due to an explosion, etc. The most prevalent cause is tectonic movements. There exists enormous pressure and temperature gradients between the lithosphere and the earth's core causing convective currents in the mantle which force the brittle lithosphere to move in fits and starts. Almost all major earthquakes are tectonic in origin and occur at plate boundaries due to inter-plate (i.e. between plates) activity.

..... (06 Marks)

II- How can Seismologists determine an Earthquake epicenter distance?

The seismologist lines up the P waves and S waves on each seismogram (or the lag time) with the curves on a graph of time versus distance. The curves on the graph were made using information from earthquakes that happened in the past.

Then, the seismologist uses the graph to figure out the difference in arrival times of the P and S waves at each location. The seismologist can use the difference in arrival times to figure out when the earthquake happened. The seismologist can also determine how far away each station is from the epicenter of the earthquake.

..... (05 Marks)

III- Write briefly on the following (09 marks)

a. Liquefaction Induced.

Liquefaction takes place when seismic shear waves pass through a saturated granular soil layer, distort its granular structure, and cause some of the void spaces to collapse.

b. Tsunamis.

Tsunamis are water waves that are caused by sudden vertical movement of a large area of the sea floor during an undersea earthquake. Tsunamis are often called tidal waves, but this term is a misnomer. Unlike regular ocean tides, tsunamis are not caused by the tidal action of the Moon and Sun. The height of a tsunami in the deep ocean is typically about 1 foot, but the distance between wave crests can be very long, more than 60 miles. The speed at which the tsunami travels decreases as water depth decreases.

c. Seismic gap.

A seismic gap is a zone along a tectonically active area where no earthquakes have occurred recently, but it is known that elastic strain is building in the rocks. If a seismic gap can be identified, then it might be an area expected to have a large earthquake in the near future.

IV- Chose the most accurate answer: (20 marks)

1- How many seismograph stations are needed to measure the distance of the epicenter of an earthquake?

(a) 1

(b) 2

(c) 3

2- Earthquakes can occur with _____ faulting.

(a) Normal and reverse

(b) Normal and thrust

(C) All above

3- By analyzing the difference in the time it takes for P waves and S waves to arrive at a seismograph station, scientists can determine an earthquake's _____

(a) Epicenter

(b) Earthquake Magnitude

- (c) Earthquake Intensity
- 4- *As rupture along a fault initiates, waves of energy travel outward from the hypocenter in a:*
- (a) Linear fashion.
 - (b) A straight line path.
 - (c) A spherical fashion.
- 5- *Good evidence that the Earth has a layered structure is where seismic waves:*
- (a) Suddenly change paths when the density abruptly changes
 - (b) Travel in gently curving paths due to refraction
 - (c) Travel in gently curving paths due to total internal reflection
- 6- *Most severe earthquakes occur _____*
- (a) In mountains
 - (b) At plate boundaries
 - (c) In the middle of plates
- 7- *The principal characteristics which influence the damage that can be caused by an earthquake are:*
- (a) Earthquake Liquefaction and Tsunami.
 - (b) Rock avalanches.
 - (c). All of the above.
- 8- *The relevant factors responsible for Earthquake site response are:*
- (a) The depth of the soil layer and its moisture content.
 - (b) The nature of the underlying geologic formation- unconsolidated material or hard rock.
 - (C) All of the above.
- 9- *What are three main causes of earthquakes?*
- (a) Volcanoes, movement of the tectonic plates, tsunamis

(b) Volcanoes, the moon's gravitational forces, tectonic plate movement

(c) Volcanoes, movement of the tectonic plates, human activity such as bombs

10- *The point where movement occurred which triggered the earthquake is the _____.*

(a) Epicenter

(b) Focus

(c) Strike

V- Complete the space: (08 Marks)

a. Rock particles move perpendicular to the direction of wave travel when an S wave passes through the rock.

b. Earthquakes can be caused by various reasons such as Volcanics, Faults, Plate tectonics

c. . Slope , moisture , nature of the underlying geologic formation are important factors in determining the amount of ground shaking that might be produced at a particular site.

d. Earthquake Shadow is a zone along a tectonically active area where no earthquakes have occurred recently.