

NAME _____ **STUDENT I.D.** _____

EARTH 270: DISASTERS AND NATURAL HAZARDS

FINAL EXAM April 10, 2017 (2.5 Hours)

50 Questions: 4 marks each (Total of 200 marks)

ANSWER ALL QUESTIONS; ILLUSTRATE YOUR ANSWERS WHERE POSSIBLE

1. Mexico's Colima volcano continues to erupt in 2017. What is the plate tectonic setting of this eruption?
2. Why is a consideration of time important in georisk assessment?
3. Tropical Cyclone Debbie hit Queensland, Australia in late March. Is the direction of movement in this rotating cyclone system a) clockwise or b) anticlockwise ?

4. To what extent do you think that the following statement is correct : "**Earthquakes don't kill people, buildings do.**" Explain your answer.

5. If a natural hazard has a return interval of 200 years what is the annual probability of occurrence of that hazard?

6. Outline a three-step methodology for assessing the magnitude and frequency of asteroid impacts on Earth.

7. a) Comment on the size-frequency relations of NEOs. b) What are the implications of this relation for impact hazard assessment.

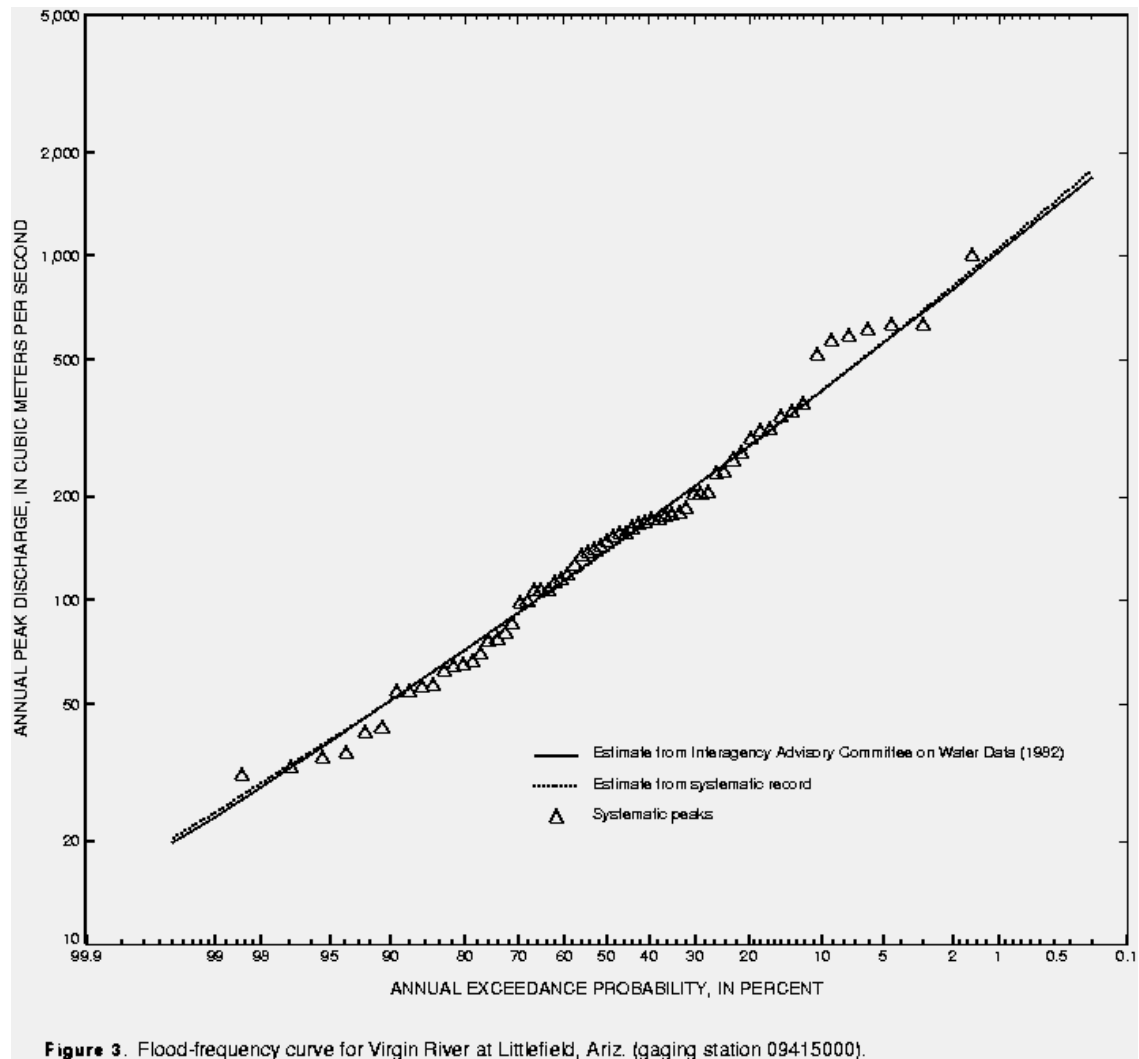
11. In what region of the Earth do most hurricanes occur?

12. Define a flood.

13. List four major causes of floods.

14. Outline three approaches to flood hazard mitigation.

15. Using the diagram below estimate the discharge of the 100 year flood.



16. Explain the steps you would take to use the result in Question 15 to make a flood zoning map for flood plain management.

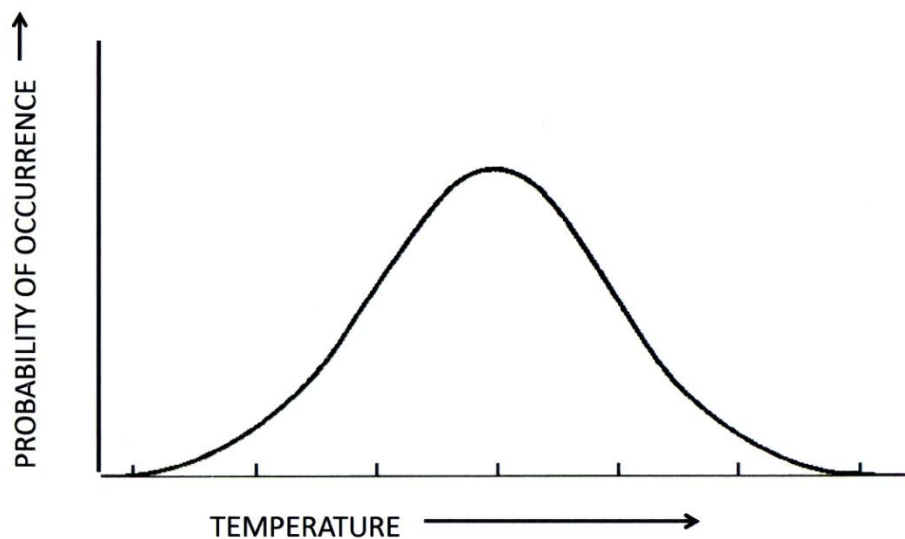
17. Sketch a typical flood hydrograph.

18. With reference to your sketch in Question 17 indicate how the construction of flood control dams mitigate flood hazard. Illustrate your answer.

19. What is the name of the intensity scale for tornadoes? What is it based on?

20. What is the Little Ice Age? Explain its relationship to recent climate change.

21. With reference to the diagram below what are the natural hazard implications of an increase in mean global temperature? Illustrate and label the effect on the diagram.



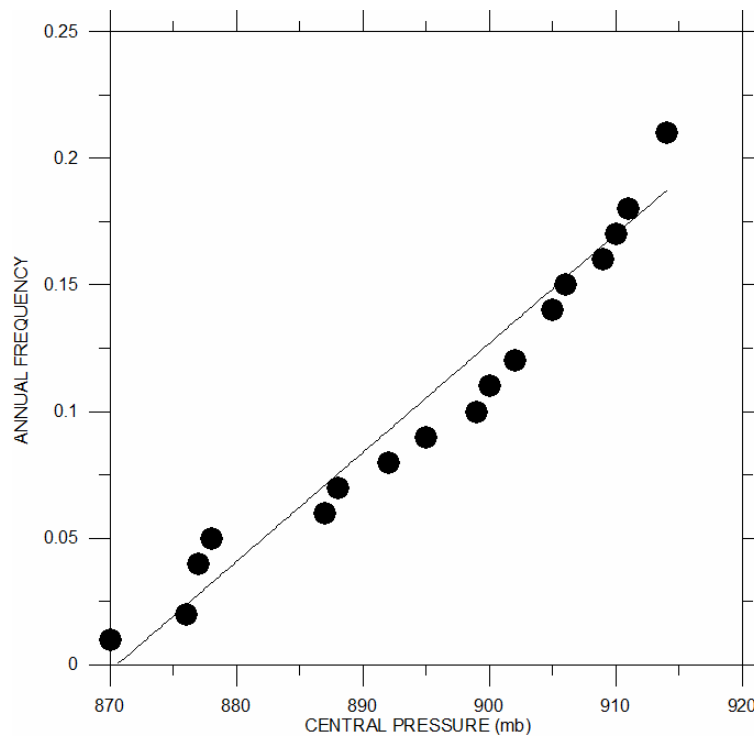
22. Why are megadeltas so vulnerable to the effects of climate change?
23. List three major glacial hazards.
24. Explain how glacier retreat conditions the formation and failure of moraine-dammed lakes. Illustrate your answer.
25. What is the main energy source that drives atmospheric hazards?

26. With respect to landslide mitigation, what approach is appropriate when nothing can be done to prevent a catastrophic landslide occurrence?
27. List two common landslide triggers.
28. What is the velocity threshold for catastrophic landslides? What is the basis for this threshold?
29. List two secondary effects of landslides which extend the zone of damage beyond the limits of the landslide debris.
30. Explain the difference between the Richter Scale and the Mercalli Intensity Scale for earthquakes.

31. Why is the maximum age of the oceanic crust much younger than the continental crust?
32. Outline three alternative strategies for reducing life loss in disasters.
33. What is the relationship between earthquake magnitude and length of source fault? Plot this relationship.
34. What are the main lessons learned from the Great Indian Ocean Tsunami of 2004 ?
35. Which of the following cities in Canada is most vulnerable to earthquake risk ;
Toronto, Waterloo, Montreal, Halifax.

36. How does the principle of precedence relate to an evaluation of the 2010 Haiti earthquake disaster?

37. The diagram below shows the relationship between central air pressure in hurricanes and the annual frequency of that air pressure. Explain the implications of this plot for the magnitude (as measured by the Saffir-Simpson scale) and frequency of hurricanes.



38. With reference to your answer in Question 37, how would this relation theoretically change under conditions of global warming? Plot this change on the diagram in Question 37.

39. What does the equation $F=aM^{-b}$ tell us about the magnitude and frequency of natural hazards? Illustrate your answer.
40. Define the Factor of Safety commonly used in landslide analysis.
41. With respect to your answer in Question 40 explain how coastal erosion may result in landslides along a steep coastal zone.
42. Why is the maximum age of the oceanic crust much younger than the continental crust?
43. What are the implications of your answer in Question 42 for the occurrence of natural hazards ?

44. List three processes that generate tsunamis.
45. The giant 2010 Chilean earthquake (M8.8) is one of the strongest earthquakes ever recorded. Historical evidence from the observations of Darwin (during the voyage of the *Beagle*) indicates a similar event occurred in 1835. (a) based on this data what is the annual probability of occurrence of a megathrust earthquake on the Chilean coast (near Concepcion, (b) how would you extend the mega-earthquake event record of this part of the Chilean coast into pre-historical time for the purposes of seismic hazard assessment.
46. List three reasons why the Philippines are so prone to natural disasters.
47. What is the plate tectonic setting of the volcanic eruptions that occurred in the Red Sea area in 2011?

48. List three elements of a hurricane mitigation strategy.
49. What are three hazards associated with major subduction zones in the Pacific?
50. What is the main reason that the number of disasters has increased dramatically in the last 50 years?
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