Question bank Geodesy

1- A plane will travel from Erbil to a place in Fiji Islands as shown in the figure. If the radius of the earth is 6378 km, find the coordinates of the place in Fiji Islands. Note: $\Delta\lambda > 90$

2- Find the distance between Erbil and Dokan along the parallel of latitude 36°N, if the difference in longitude between them is one degree and the radius of the earth is 6378 km

3- If the time at Greenwich meridian is $12^h\ 23^m\ 33^s$ on 31/12/2013 and the longitude of Honolulu is 160°W, find the local date and time at: A place 30° east of Honolulu A place 30° west of Honolulu

4- If the local apparent time of an observatory at Erbil is $12^h\ 24^m\ 48^s$, the longitude of Erbil is 44° 01' 11" E and the local mean time is $12^h\ 12^m\ 12^s$, the equation of time at Greenwich mean noon being $4^m\ 2.31^s$. Find the rate of decrease (r) in the equation of time in (s/hr)

5- An aircraft leaves point A (36°N, 160°E) to point B (23°S, 150°W) along the shortest route. If a=6378km and b= 6356km. find distance and azimuth at takeoff

6- If the time at Erbil is $14^h\ 09^m\ 08^s$ and the difference in time between Erbil and Greenwich meridian is +3 hours, Find the longitude of Erbil, longitude of a place where the time is $16^h\ 25^m\ 12^s$ and the longitude of a place where the time is 5 hours in advance of Erbil.

7- Find the shortest distance between two places on the earth. The first place is on the equator at longitude of 25°E. The second place is located in the middle-way of the equator and the south pole at longitude of 170°E. Assume an ellipsoidal shape of the Earth with a= 6378 km, b= 6356 km What is the difference in the distance, if a spherical shape was used for the Earth?

8- The local mean time at an observatory in Erbil is $8^h\ 28^m\ 38^s$. If the longitude of the observatory is 44° 34' 24"E, find the local apparent time at the observatory provided that the equation of time at Greenwich Mean Noon is $-3^m\ 2.22^s$ and decreasing at a rate of 0.38 S/hr

9- Which of the following ellipsoids has bigger surface? First ellipsoid: semi-major axis is 6378 km and semi-minor axis is 6356 km (oblate ellipsoid). second ellipsoid: semi-major axis is 6390 km and semi-minor axis is 6350 km (prolate ellipsoid).

10- 17- An aircraft leaves from London to a place on the surface of the earth at the intersection of Greenwich meridian with the equator along the shortest route.
1- What distance must it travel in nautical miles.
2- What azimuth must it take on take-off at London.
3- Calculate the radius of curvature at Azimuth 45° for the first place.
given: a= 6387 km b= 6356 km London coordinates: (52°30′20″ N 0°7′35″ W)

11- 18- If the G.M.T. is $07^h\ 44^m\ 41^s$, the equation of time in the same day at G.M.N. is $14^m\ 3.31^s$. the E.T.at G.M.T. is $14^m\ 4.2^s$. Find the rate of decrease in the E.T. in minutes / week. Given the longitude of Erbil = 45º.

12- Find the shortest distance between Canberra and Honolulu and the azimuth from Canberra to Honolulu given an ellipsoidal shape of the earth with semi-major axis of 6370km and eccentricity of 0.079181 Canberra: $35^0$18’ S, $149^0$7’ E Honolulu: 21°18' N, 157°50' W

13- Find the distance between Istanbul and Rize along the parallel of latitude 41°N, if Rize is ahead of Istanbul in Longitude by 11 degrees and the radius of the earth is 6370 km. Then find the longest distance between them on the great circle.

14- Using Napier’s Rule, calculate the spherical excess of the spherical triangle Mardin-Ramsar-North Pole. Then calculate the angle of the spherical side between Mardin and Ramsar.

Mardin (E, N) is located west and north of Ramsar given the following data:

Coordinates of Ramsar are: 50°39'30" E, 36°53'50" N

Azimuth Mardin to Ramsar = 90^0 and azimuth Ramsar to Mardin = 276^0

15- Given the coordinates of two points on the Earth's surface, point A (45°N, 90°E) and point B (30°S, 120°W), calculate the shortest distance between them using an ellipsoidal model of the Earth with a semi-major axis of 6371 km and a semi-minor axis of 6356 km.

16- If the local mean time at a city with a longitude of 60°E is 15:30, and the equation of time at Greenwich Mean Noon is -6 minutes, what is the local apparent time at the city?

17- Determine the distance between two cities, City A located at 30°N, 45°E and City B located at 45°S, 135°W, considering the Earth as a sphere with a radius of 6371 km.

18- Calculate the angle of the spherical side between two cities, City X (30°N, 60°E) and City Y (40°S, 90°W), using Napier's Rule.
19- If the difference in time between two cities is 4 hours and the longitude difference between them is 60°, what is the rate of change of time in seconds per hour?
20- Calculate the distance between two cities, City P (35°N, 80°E) and City Q (45°S, 120°W), using the Vincenty formula and considering the Earth as an ellipsoid with a semi-major axis of 6378 km and a flattening factor of 1/298.257223563.
21- Given the coordinates of two points, Point X (20°N, 60°E) and Point Y (40°S, 120°W), determine the azimuth from Point X to Point Y using an ellipsoidal model of the Earth.
22- Find the geodetic azimuth between two cities, City M (25°N, 100°E) and City N (35°S, 90°W), using the ellipsoidal model of the Earth with a semi-major axis of 6371 km and a flattening factor of 1/298.257223563.
23- Determine the distance between two cities, City R (40°N, 50°E) and City S (50°S, 150°W), considering the Earth as an oblate spheroid with a semi-major axis of 6370 km and a semi-minor axis of 6350 km.
24- Calculate the shortest distance between two cities, City C (10°N, 40°E) and City D (60°S, 150°W), using the Great Circle distance formula and considering the Earth as a perfect sphere with a radius of 6400 km.

25. What is the definition of geodesy?

a) The study of Earth's magnetic field

b) The science of measuring and understanding Earth's shape, orientation in space, and gravitational field

c) The study of earthquakes and seismic waves

d) The exploration of underwater topography

26. Who is considered the father of modern geodesy?

a) Isaac Newton

b) Eratosthenes

c) Carl Friedrich Gauss

d) Johannes Kepler

27. Which instrument is commonly used in geodesy to measure angles between celestial objects?

a) Theodolite

b) Altimeter

c) Sextant

d) Compass

28. What is the purpose of geodetic datums?

a) To define the reference surface and coordinate system for mapping Earth's surface

b) To measure seismic activity

c) To calculate ocean currents

d) To predict volcanic eruptions

29. What are geoid models used for in geodesy?

a) To represent Earth's gravity field

b) To study ocean currents

c) To predict climate change

d) To map underground caves

30. Which mathematical shape best approximates the Earth's surface?

a) Perfect sphere

b) Ellipsoid

c) Cube

d) Pyramid

31. What is the significance of the WGS84 datum?

a) It is used as the reference system for GPS

b) It predicts earthquakes

c) It measures ocean currents

d) It calculates volcanic eruptions

32. Which satellite system is commonly used for positioning and navigation in geodesy?

a) Galileo

b) Hubble

c) Voyager

d) Landsat

33. What is the concept of geodetic control networks?

a) A system of control points used for accurate positioning and mapping

b) A network of underground caves

c) A method to study ocean currents

d) A model to predict earthquakes

10. What is the primary unit of measurement in geodesy for angles?

a) Radians

b) Degrees

c) Meters

d) Arcseconds

11. How does geodesy contribute to civil engineering projects?

a) By providing accurate measurements for construction and infrastructure projects

b) By studying ocean currents

c) By predicting volcanic eruptions

d) By mapping underground caves

12. What is the difference between geocentric and geodetic coordinates?

a) Geocentric coordinates are based on the Earth's center, while geodetic coordinates are based on the surface.

b) Geodetic coordinates are used for space exploration, while geocentric coordinates are used for mapping.

c) Geodetic coordinates measure time, while geocentric coordinates measure distance.

d) There is no difference; the terms are interchangeable.

13. Which phenomenon causes variations in Earth's gravity field?

a) Seismic waves

b) Ocean currents

c) Density differences in Earth's interior

d) Volcanic eruptions

14. What is the purpose of geopotential models in geodesy?

a) To represent Earth's topography

b) To predict earthquakes

c) To model variations in Earth's gravity field

d) To measure ocean currents

15. What is the significance of the International Terrestrial Reference Frame (ITRF)?

a) It provides a common reference system for geodetic measurements worldwide.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

16. How does satellite altimetry contribute to geodesy?

a) By measuring ocean surface topography

b) By mapping underground caves

c) By studying atmospheric pressure

d) By predicting earthquakes

17. What role does geodesy play in satellite positioning systems like GPS?

a) It provides the mathematical framework for precise positioning calculations.

b) It predicts volcanic eruptions

c) It measures ocean currents

d) It studies seismic activity

18. What is the primary method used in geodesy to measure the Earth's shape and size?

a) Satellite imagery

b) Global Positioning System (GPS)

c) Ground-based surveys

d) Sonar technology

19. How does geodesy contribute to climate studies?

a) By monitoring changes in sea level and ice caps

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

20. What is the role of geodesy in determining land boundaries between countries?

a) By providing accurate measurements for boundary demarcation

b) By predicting earthquakes

c) By measuring ocean currents

d) By mapping underground caves

21. What is the concept of geoid height?

a) The difference between the geoid and the ellipsoid at a specific location

b) The height of mountains above sea level

c) The depth of ocean trenches

d) The distance from the Earth's center to its surface

22. How does geodesy contribute to disaster management?

a) By providing accurate mapping and positioning data for emergency response

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying seismic activity

23. What is the primary function of geodetic surveying?

a) To measure and map Earth's surface features with high precision

b) To predict earthquakes

c) To measure ocean currents

d) To study atmospheric pressure

24. What is the relationship between geodesy and GIS (Geographic Information Systems)?

a) GIS uses geodetic data for spatial analysis and visualization.

b) Geodesy predicts volcanic eruptions

c) GIS measures ocean currents

d) Geodesy studies seismic activity

25. What is the difference between geodesy and geophysics?

a) Geodesy focuses on Earth's shape and orientation, while geophysics studies its internal structure and processes.

b) Geodesy predicts earthquakes, while geophysics measures ocean currents.

c) Geodesy studies atmospheric pressure, while geophysics measures seismic activity.

d) Geodesy studies the Moon's surface, while geophysics studies Earth's atmosphere.

26. How does geodesy contribute to the study of plate tectonics?

a) By monitoring movements of tectonic plates with GPS

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

27. What is the significance of the reference ellipsoid in geodesy?

a) It serves as a mathematical model of Earth's shape for geodetic calculations.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

28. What is the concept of geodetic leveling?

a) The measurement of height differences between points on Earth's surface

b) The study of ocean currents

c) The prediction of volcanic eruptions

d) The

measurement of atmospheric pressure

29. How does geodesy contribute to the field of archaeology?

a) By providing precise mapping and positioning for archaeological sites

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

30. What is the significance of the Earth's gravity field in geodesy?

a) It provides information about the mass distribution and shape of Earth.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

31. How does geodesy contribute to the study of sea-level rise?

a) By providing accurate measurements of changes in sea level over time

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

32. What is the role of geodesy in the development of geothermal energy resources?

a) By mapping subsurface geological structures

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

33. What is the concept of orthometric height in geodesy?

a) The height above a geoid reference surface

b) The height above the ellipsoid

c) The height above sea level

d) The height above the atmosphere

34. How does geodesy contribute to satellite communications?

a) By providing precise positioning for satellite dish alignment

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

35. What role does geodesy play in the exploration and exploitation of natural resources?

a) By providing accurate mapping and positioning data for resource extraction

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying seismic activity

36. How does geodesy contribute to the study of Earth's magnetic field?

a) By monitoring changes in Earth's magnetic field with satellite measurements

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

37. What is the significance of the North American Datum of 1983 (NAD83) in geodesy?

a) It serves as the reference coordinate system for mapping in North America.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

38. How does geodesy contribute to the study of glacier movement and ice sheet dynamics?

a) By using satellite data to monitor changes in ice mass and movement

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

39. What role does geodesy play in the study of Earth's mantle dynamics?

a) By using GPS to monitor crustal deformation and plate movements

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying seismic activity

40. What is the significance of the European Terrestrial Reference System (ETRS89) in geodesy?

a) It provides a common reference system for geodetic measurements in Europe.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

41. How does geodesy contribute to the study of Earth's climate history?

a) By using satellite data to monitor changes in sea level and ice cores to study past climates

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

42. What is the role of geodesy in the study of Earth's water cycle?

a) By using satellite data to monitor changes in precipitation and runoff

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying seismic activity

43. How does geodesy contribute to the study of Earth's interior structure?

a) By using seismic waves to image the Earth's interior

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

44. What is the concept of geodetic reference frames?

a) A coordinate system fixed to Earth's surface used for geodetic measurements

b) A model for predicting volcanic eruptions

c) A method for measuring ocean currents

d) A framework for studying atmospheric pressure

45. What is the role of geodesy in space missions and satellite orbits?

a) By providing accurate measurements for satellite positioning and trajectory calculations

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

46. How does geodesy contribute to the study of Earth's gravitational field?

a) By using satellite data to map variations in gravitational acceleration

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

47. What is the significance of the Global Geodetic Observing System (GGOS) in geodesy?

a) It coordinates global efforts in geodetic observations and research.

b) It measures ocean currents

c) It predicts volcanic eruptions

d) It calculates seismic activity

48. How does geodesy contribute to the study of Earth's crustal deformation and earthquake activity?

a) By using GPS to monitor tectonic plate movements and strain accumulation

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

74. What is the role of geodesy in the study of Earth's rotation and polar motion?

a) By using observations of celestial bodies to monitor changes in Earth's orientation

b) By predicting earthquakes

c) By measuring ocean currents

d) By studying atmospheric pressure

75. How does geodesy contribute to the study of sea-level change and its impact on coastal regions?

a) By using satellite data to monitor changes in sea level and coastal subsidence

b) By predicting volcanic eruptions

c) By measuring ocean currents

d) By studying atmospheric pressure

76 What is the definition of geodesy?

77. Who is considered the father of modern geodesy?

78. What are the primary objectives of geodesy?

79. What are geodetic datums, and why are they important?

80. How does geodesy differ from geography?

81. What is the concept of a geoid?

82. What are some common applications of geodesy?

83. How do geodesic measurements contribute to our understanding of Earth's shape and size?

84. What role does geodesy play in the development of navigation systems?

85. What are some challenges in conducting geodetic surveys?

86. How does geodesy contribute to the study of tectonic plate movements?

87. What role does geodesy play in the study of sea-level rise and climate change?

88. How do geodesic measurements help in determining accurate land boundaries between countries?

89. What is the relationship between geodesy and cartography?

90. How has satellite technology revolutionized the field of geodesy?

91. What is the significance of the Earth's gravity field in geodesy?

92. How does geodesy contribute to the study of Earth's magnetic field?

93. What is the purpose of geodetic reference frames?

94. How does geodesy contribute to disaster management and mitigation efforts?

95. What role does geodesy play in urban planning and infrastructure development?

96. How do geodetic measurements aid in the exploration and exploitation of natural resources?

97. What is the importance of geodetic leveling in construction projects?

98. How does geodesy help in monitoring and predicting seismic activity?

99. What are some advancements in geodetic techniques in recent years?

100. How does geodesy contribute to the study of Earth's interior structure and composition?

101. What is the significance of geodesy in space exploration missions?

102. How do geodetic measurements assist in studying glacier movement and ice sheet dynamics?

103. What role does geodesy play in understanding Earth's water cycle?

104. How does geodesy contribute to the study of Earth's climate history?

105. What are some future directions and challenges in the field of geodesy?