Practice final exam

Multiple choice questions

1. What is the best definition of spectral resolution in remote sensing?
   a. The smallest separation between two objects on the ground that can be detected by
      the remote sensing system
   b. The area on the ground covered by one detector element in the remote sensing
      instrument
   c. The length of time between repeated observations of the same area
   d. The number and size of wavelength bands in the electromagnetic spectrum that the
      instrument can detect

2. Information that shows the relationships between features and describes how spatial data
   share geometric attributes is known as ________________. This information is necessary for
   network analysis.
   a. Spatial autocorrelation
   b. Connectivity
   c. Topology
   d. Topography

3. Consider the image above, which is part of the Paris metro map. If you were to think of the
   metro system as a network, what would you call the Concorde station in the upper left corner?
   a. A node
   b. An edge
   c. A turn
   d. A base
4. Using the same map and treating the Paris metro as a network, what would you call the lines between the stations?
   a. Connectors
   b. Turns
   c. Vertices
   d. Edges

5. What type of network would best represent the Paris metro, assuming that people can freely travel along each metro line?
   a. A utility network
   b. A directed network
   c. An undirected network
   d. A social network

<table>
<thead>
<tr>
<th></th>
<th>Concorde</th>
<th>Champs Élysées Clemenceau</th>
<th>Invalides</th>
<th>Musée d’Orsay</th>
<th>Assemblée Nationale</th>
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6. The table above is a hypothetical impedance matrix showing the average travel time in seconds between five stations on the Paris metro. Using this table, what is the shortest path (in terms of travel time) between the Musée d’Orsay station and the Champs Élysées Clemenceau station?
   a. Musée d’Orsay -> Invalides -> Champs Élysées Clemenceau
   b. Musée d’Orsay -> Assemblée Nationale -> Invalides -> Champs Élysées Clemenceau
   c. Musée d’Orsay -> Invalides -> Concorde -> Champs Élysées Clemenceau
   d. None of the above. There is no way to travel between the two stations.

7. A river system is an example of what type of network?
   a. A utility network
   b. A directed network
   c. An undirected network
   d. A social network

8. A region that includes all the parts of a network that can be reached from one point within a certain impedance value is known as a ____________________________.
   a. Location-allocation
   b. Shortest path
   c. Chronometric connectivity polygon
d. Network service area

9. The process of finding a geographic location from a street address is known as ___________.
   a. Geocoding
   b. Ground truthing
   c. Coordinate fixing
   d. Address targeting

10. You are given a raster file containing average temperature data for a study area. The temperatures range from 24 °F to 45 °F. What procedure would you use to create a new raster showing only two categories: areas with average temperatures above freezing and areas with average temperatures below freezing?
   a. Map algebra
   b. Reclassification
   c. Map overlay
   d. Geocoding

11. If the percent of a slope is 100%, what is the degree of the slope?
   a. 0°
   b. 45°
   c. 90°
   d. None of the above

12. If a 50% slope is facing directly east, what is the slope’s aspect?
   a. 0°
   b. 90°
   c. 180°
   d. 270°

13. The contiguous triangles on a Triangulated Irregular Network (TIN) are known as ___________.
   a. Facets
   b. Angles
   c. Contour polygons
   d. Planes

14. If you were trying to find the temperature in an area without a weather station, what procedure could you use to estimate the temperature using known values from nearby weather stations?
   a. Point pattern analysis
   b. Spatial interpolation
   c. Map algebra
   d. Network service area analysis
15. The map above shows a set of points with polygons representing the areas that are closest to each point. This map is an example of _________________.
   a. A Triangulated Irregular Network
   b. Inverse Distance Weighting
   c. Kriging
   d. Thiessen Polygons

16. Given this set of numbers, (1,1,2,3,4,5,11), what is the median?
   a. 1
   b. 3
   c. 4.5
   d. 11

17. Given the same set of numbers, (1,1,2,3,4,5,11), what is the mode?
   a. 1
   b. 3
   c. 4.5
   d. 11

18. The graph above is an example of a _________________.
   a. Positively skewed distribution
   b. Uniform distribution
   c. Negatively skewed distribution
   d. Normal distribution

19. The centroid or mean center of an unweighted distribution of points is found by …
   a. Dividing the points into grid cells and counting the number of points in each cell.
   b. Calculating the average nearest neighbor distance of all points in the study area.
   c. Calculating the median x and y coordinates for all the points in the study area.
   d. Calculating the mean x and y coordinates for all the points in the study area.
20. The mean center of bird sightings of one species (Species A) is located at 30° N 111° W. The mean center of bird sightings of a second species (Species B) is located at 30° N 115° W. What does that tell you about the likely range of each species?
   a. The range of Species B is, on average, farther south than the range of Species A
   b. The range of Species B is, on average, farther north than the range of Species A
   c. The range of Species B is, on average, farther west than the range of Species A
   d. The range of Species B is, on average, farther east than the range of Species A

21. You are analyzing a set of GIS data with the household locations of people who have contracted thyroid cancer in your city in the past 5 years. You want to investigate whether the cases of cancer are related to each other, which might point to an underlying environmental cause. What type of pattern would you expect to find if the cancer cases were related to each other due to some underlying environmental cause?
   a. A random pattern
   b. A clustered pattern
   c. A uniform pattern
   d. None of the above

22. A GIS dataset in which neighboring features are more similar to each other than features that are farther apart is an example of ____________________________. 
   a. Positive spatial autocorrelation
   b. Negative spatial autocorrelation
   c. A random pattern
   d. A dispersed pattern

23. For spatial interpolation to be effective, the data must exhibit __________________. 
   a. Statistical randomness
   b. Positive spatial autocorrelation
   c. Negative spatial autocorrelation
   d. All of the above

24. A Moran’s I value of –0.9 implies that __________________. 
   a. The data show no autocorrelation
   b. The data are positively autocorrelated
   c. The data are negatively autocorrelated
   d. A and C

25. If the locations of a certain tree species depend on the availability of scarce soil nutrients so that trees closer together are competing with each other for access to nutrients, what kind of spatial pattern would the trees probably exhibit?
   a. There is not enough information to say
   b. A random pattern
   c. A clustered pattern
   d. A dispersed pattern
26. What procedure could you use to determine if a point pattern is or is not uniformly distributed?
   a. Average nearest neighbor analysis
   b. Quadrat counts
   c. Network service area analysis
   d. A and B

27. The way that a map communicates the order or importance of different features is known as its ________________.
   a. Simultaneous contrast
   b. Color scheme
   c. Visual arrangement
   d. Visual hierarchy

28. Which two colors should not be included in the same color scheme on a map in order to ensure that readers who have the most common form of colorblindness can accurately interpret the map?
   a. Blue and red
   b. Purple and orange
   c. Red and green
   d. Red and yellow

29. The ________________ relationship determines how the most important thematic features of a map are differentiated from the less important background information in the map.
   a. Legibility
   b. Color schematic
   c. Compositional
   d. Figure-ground

30. The three images above (I, II, III) represent three different raster layers. If you were to use map algebra to calculate the local minimum across all three layers, what would the resulting raster layer look like?

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   a. 1 2 1
31. Which of the following map projections properly represents the shapes of features and is best used in areas that are longer north-south than east-west?
   a. Albers Equal Area projection
   b. Transverse Mercator projection
   c. Mollweide projection
   d. Gnomonic projection

32. Which type of map alters the size of point features according to the value of the variable at each point?
   a. Choropleth map
   b. Dot density map
   c. Proportional symbol map
   d. Isarithmic map

33. Which of the following maps would probably have the largest scale?
   a. A map of global shipping routes
   b. A map of national election results
   c. A map of pinyon pine habitat in Nevada
   d. A map of bike paths in Logan

34. The remote sensing technology that uses pulses of laser light that are reflected back to the receiver to record 3-dimensional features is known as ________________.
   a. RADAR
   b. LiDAR
   c. Hyperspectral imaging
   d. Passive aerial photography
35. The map above shows the area (in light gray) that can be accessed via bus or light rail within 15 minutes from the intersection of 700 E and 400 S in Salt Lake City. The procedure used to generate this kind of map is known as ______________________________.
   a. Network service area analysis
   b. Spatial autocorrelation analysis
   c. Geocoding
   d. Average nearest neighbor distance analysis

36. You are given a set of raster layers showing land cover in a study area each year for 20 years. What map algebra operation could you use to determine which land cover type was most frequent in each cell during the whole 20 year period?
   a. Minority
   b. Diversity
   c. Majority
   d. Standard deviation

37. Given the same set of raster layers, what map algebra operation could you use to determine how many times the land cover type changed in each cell during the 20 year period?
   a. Minority
   b. Diversity
   c. Majority
   d. Standard deviation

38. The Tropic of Cancer, a line of latitude at 23º 26’ North, is an example of a ________________.
   a. Great Circle
   b. Meridian
   c. Small Circle
   d. Geodesic buffer

39. Which type of map alters the shading or color of area/polygon features according to the value of the data in each area/polygon?
   a. Dot density map
   b. Proportional symbol map
   c. Isarithmic map
   d. Choropleth map
40. What visual variable would be best to use to display an ordered set of data, such as the number of cat-owning households by state?
   a. Color hue
   b. Color value
   c. Position
   d. Shape

**Short answer questions**

*Please provide a short answer to the following questions (no more than 5 sentences).*

41. List two types of remote sensing technologies. For each type, briefly describe how the technology works.

42. Describe one example of a geographic problem or question that could be solved using GIS. Specify at least two GIS tools you would use to solve the problem.