

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011
Ph.D (GEOMATICS)
COURSE CODE: 131

Register Number: _____

Signature of the Invigilator
(with date)

COURSE CODE: 131

Time: 2 Hours

Max: 400 Marks

Instructions to Candidates:

1. Write your Register Number in the space provided on the top of this page and fill in the Page 1 of the Answer sheet using Pen.
2. Do not write your name anywhere in this Booklet or Answer Sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the **ANSWER SHEET** using **HB Pencil**.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct Answer will fetch 4 marks.
5. Do not write anything in the Question Paper. Use the white sheets attached at the end for rough works.
6. Do not open the Question Paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will Disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table And wait for the Invigilator to collect them.
9. Use of Calculators, Tables etc. are prohibited.

1. Indicate which of the following remote sensing type would be best suited to detect deforestation.
 - a. Color infrared
 - b. Sonar
 - c. Radar
 - d. Thermal Infrared

2. To study the effects of drought on vegetation using multispectral remote sensing, which portion of the electromagnetic spectrum would provide the most pertinent data?
 - a. Red
 - b. Middle infrared
 - c. Near infrared
 - d. Thermal infrared

3. What does 20 minutes represent using the latitude and longitude system (degrees, minutes, seconds)
 - a. $\frac{1}{4}$ hour
 - b. 500 seconds
 - c. $1/10^\circ$
 - d. $1/3^\circ$

4. What is an oblate ellipsoid?
 - a. a circle rotated about an ellipse
 - b. an ellipse rotated about a circle
 - c. an ellipse rotated about its axis
 - d. an ellipse rotated about its shorter axis

5. An automated system for the capture, storage, retrieval, analysis, and display of spatial data is known as :
 - a. A GPS
 - b. An inertial central unit
 - c. A GIS
 - d. An image processing software

6. What does DGPS stand for?
 - a. Deconvolved Generic Positioning System
 - b. Direct Global Positioning System
 - c. Differentiated Geographic Positioning System
 - d. Differential Global Positioning System

7. Precise measurement of Earth features can be obtained from :
- High-oblique photographs.
 - Low-oblique photographs.
 - Vertical aerial photographs.
 - All the above types of aerial photographs.
8. Lines connecting points of equal air temperature are known as :
- Isohyets
 - Isotherms
 - Isobars
 - Contour Lines
9. The largest scale of the following is :
- 1 : 15000
 - 1 : 6000
 - 1 : 1000000
 - 1 : 50000
10. Indicate which of the following remote sensing type would be best suited to differentiate a cricket field of artificial turf from natural grass.
- Radar imagery
 - Color photography
 - Black and white photography
 - Color infrared photography
11. Lines connecting points of equal precipitation are known as :
- Isobars
 - Contour Lines
 - Isohyets
 - None of the above
12. Which of the following remote sensing technologies uses sound?
- Radar
 - Thermal infrared imagery
 - Sonar
 - Hyperspectral imagery
13. Which of the following is not an example of spatial data?
- Lines showing the shape of linear objects

- b. Times of particular events like Earthquakes
- c. Polygons representing the area occupied by a particular variable like a land use
- d. Points showing location of discrete objects like buildings

14. Spatial referencing is the process of:

- a. Referencing geo-relational tables
- b. Establishing the topology of spatial objects
- c. Computing the reference between items in databases
- d. Combining attribute values with location information

15. What is Geographical Information Science (GISc)?

- a. The epistemological study of GIS
- b. The application of GIS to a range of scientific disciplines
- c. The science behind GIS
- d. The use of GIS to solve physical problems

16. Which of the following is not a raster data structure?

- a. Block encoding
- b. Quadtree
- c. Run-length encoding
- d. Spaghetti

17. Which of the following might be considered as the fourth dimension in GIS?

- a. Space
- b. Scale
- c. Time
- d. Location

18. What does the abbreviation DBMS stand for?

- a. Digital Base Mapping System
- b. Database Manipulation Software
- c. Database Migration System
- d. Database Management System

19. What does the abbreviation SQL stand for?

- a. Standard Query Language
- b. Spatial Quarry Language
- c. Specific Query Language
- d. System Query Language

20. What is Cartosat 2B?

- a. An Earth observation satellite carrying a Panchromatic camera enabling to acquire images with a sub-metric spatial resolution
- b. A geo-stationary satellite allowing to acquire panchromatic images of the Earth surface with a metric resolution
- c. A multispectral Earth observation satellite, dedicated to the monitoring of the environment
- d. A Radar imaging satellite with all weather capability to take image of the Earth

21. What is 'rubber sheeting'?

- a. The process of matching two adjacent map sheets
- b. The process of projecting a map from one coordinate system to another
- c. The process of stretching map coordinates to fit with known control points
- d. The process of referencing a map

22. The Douglas-Peucker algorithm is:

- a. An algorithm to triangulate a polygon
- b. An algorithm to discretize line segments
- c. An algorithm to compress images
- d. An algorithm to convert raster to features

23. What is Manhattan distance?

- a. The distance between two points in a raster data layer calculated as the number of cells crossed by a straight line between them.
- b. The distance between two points in a raster data layer calculated as the sum of the cell sides intersected by a straight line between them.
- c. The distance between two points in a vector data layer calculated as the length of the line between them.
- d. The maximum distance between two vectors

24. In map projection, the prime meridian defines:

- a. The equator line
- b. The line at which the latitude is defined to be 45°
- c. The line at which the longitude is defined to be 0°
- d. The meridian which is 180° east or west of the Greenwich Meridian

25. What is reclassification?

- a. The process of combining one or more data ranges into a new data range to create a new data layer.
- b. An analytical technique based on point data.

- c. A method based on cellular automata
 - d. The process of combing two or more data layers.
26. What are sliver polygons?
- a. Small polygons falling within bigger ones
 - b. Small polygons digitized by mistake
 - c. Long, thin polygons created when overlaying a common boundary that has been digitized twice
 - d. Small multipart polygon features
27. Which of the following overlay methods would you use to calculate the length a line within a polygon?
- a. Line-in-polygon
 - b. Union
 - c. Point-in-polygon
 - d. Intersection
28. What is point-in-polygon overlay?
- a. A method used to determine which points lie within the boundary of a polygon.
 - b. A method used to select polygon data
 - c. A method used to count the number of point within a polygon
 - d. A method used to triangulate point data
29. Which of the following spatial interpolation techniques is an example of a local, exact, abrupt and deterministic interpolator?
- a. Nearest neighbors
 - b. Ordinary Kriging
 - c. Triangulated irregular Network
 - d. Thiessen polygons
30. What is the difference between slope and aspect?
- a. Slope is the gradient directly down the fall line, while aspect is the direction of the fall line relative to north
 - b. Slope is the gradient of the fall line relative to vertical, while aspect is the direction of the fall line relative to the line of greatest slope
 - c. Slope is the distance down the fall line from the top of the slope to its bottom, while aspect is the percentage gradient of this line averaged over its full distance
 - d. Slope is the direction of the fall line, while aspect is the gradient of the fall line
31. Which of the following can be modeled using a digital terrain model?

- a. Isohyets
- b. Runoff
- c. Landuse
- d. Geology

32. Why use a gravity model?

- a. To predict the best location for new stores based on the location of competitors
- b. To compute the relative attractiveness of centres of supply relative to demand
- c. To compute point density
- d. To map the density of the Earth's crust

33. What does MAUP stand for?

- a. Modeling Areal Unit Problem
- b. Modeling Area Uncertainty of Polygons
- c. Modifiable Areal Unit Problem
- d. Mapping Areal Uniformisation Processes

34. Contour lines on a map represent place having:

- a. The same latitude
- b. The same altitude
- c. The same aspect
- d. The same pressure

35. In photogrammetry, the interior orientation refers to:

- a. The location and orientation of an image in the object coordinate system
- b. The Reconstruction of the geometric relationship of imaging in a chosen object coordinate system
- c. The selection of tie and pass points within an image stereo pair
- d. The reconstruction of a bundle of image rays with respect to the projection center

36. In remote sensing, what does the term RPC stand for?

- a. Remote Procedure Call
- b. Rational Project Conductor
- c. Rational Polynomial Coefficients
- d. Rapid Positioning Capabilities

37. The Indian Institute of Remote Sensing, under National Remote Sensing Centre, is located at:

- a. Dehra Dun
- b. Hyderabad

- c. Bangalore
- d. New Delhi

38. In Geostatistics, the term $\gamma(x,y)$ is called:

- a. Correlogram
- b. Semivariogram
- c. Covariance
- d. Variogram

39. A Monte Carlo Simulation is:

- a. A method for simulating landscape dynamics
- b. A method for simulating point distributions
- c. A method for simulating the effects of positional error on a GIS analysis
- d. A method for simulating attributal errors

40. The regional system proposed by the Indian government to improve the accuracy of global navigation satellite system receivers is called:

- a. EGNOS
- b. GLONASS
- c. MSAS
- d. GAGAN

41. The Indian INSAT satellite network was mainly dedicated to:

- a. Domestic communication in Asia-Pacific region
- b. Monitor Climate in Asia-Pacific region
- c. Military applications
- d. Monitor sea level

42. Which of the following is not a map projection?

- a. The Albers conic
- b. The Lambert conformal conic
- c. The Mollweide
- d. The Ricard cylindrical

43. What would be the best map projection to preserve areas?

- a. An azimuthal projection
- b. A cylindrical projection
- c. A conic projection
- d. A tetrahedric projection

44. In database, what is the language used to create and modify the structure of database objects?

- a. DML
- b. SQL
- c. DDL
- d. IDL

45. What is a loxodrome?

- a. A map projection used in navigation
- b. A line used in navigation to represent the jetstream route
- c. The intersection of a sphere and a plane which passes through the center point of the sphere
- d. A line crossing all meridians of longitude at the same angle

46. What is a Geoid?

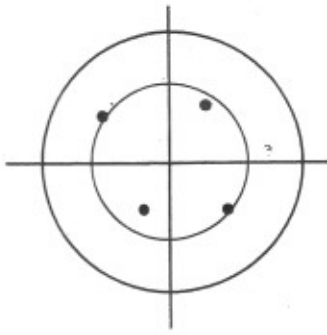
- a. A geometrical figure of the Earth
- b. A regular surface which is a mathematical idealized representation of the physical Earth
- c. An irregular surface to which the force of gravity is everywhere tangential
- d. An equipotential surface coinciding exactly with the mean ocean surface of the Earth

47. In the navigation terminology what does SBAS stand for?

- a. Survey Based Amplification Systems
- b. Satellite based Acquisition Systems
- c. Satellite Based Augmentation Systems
- d. Satellite Based Acquisition Strategies

48. The term 'accuracy' refers to:

- a. The repeatability of measurement
- b. The overall quality of the data
- c. The degree to which a value approaches its true value
- d. The disagreement between a measurement and the true or accepted value.



49. How would you qualify the above measurements?
- Accurate and precise
 - Inaccurate and imprecise
 - Inaccurate and precise
 - Accurate and imprecise
50. In data quality, 'attribute uncertainty' refers to:
- The completeness of the data
 - How well logical relations among data elements are maintained
 - The confidence that a feature has been correctly labeled or quantified
 - The amount of offset present within a data set from the true location of the features being represented
51. In database, what does DCL stand for?
- Data Control License
 - Data Constraining Language
 - Data Control Language
 - Database Control Lock
52. What is the obliquity of the Earth's axis of rotation relative to the ecliptic plane?
- 55°
 - 23.5°
 - 97.8°
 - 3°
53. If you digitize a 1:150,000 scale map to an accuracy of $\pm 0.5\text{mm}$, what would be the level of error in ground units?
- $\pm 0.5\text{ m}$
 - $\pm 75\text{ m}$
 - $\pm 150\text{ m}$
 - $\pm 300\text{ m}$

54. You need to find the scale of a map. You know that the real distance between two features is 75 km. On the map, that same distance is 2.5 cm. What is the scale of the map?
- 1 : 3 000 000
 - 1 : 3 000
 - 1 : 1 500 000
 - 1 : 15 000
55. You need to query a huge relational database. What clause or command would you use to improve the speed of data retrieval operations?
- A "having" clause
 - A "group by" clause
 - A "index" command
 - A "alter" command
56. In a database table, can a column defined as "primary key" have "nulls"?
- True
 - False
 - Under conditions
 - True, if and only if a foreign key exists
57. Which of the following is not a database object?
- A table
 - A report
 - A relationship
 - A report
58. Which of the following statement is not a reason why remote sensing is useful in the field of physical geography?
- It is always more reliable than field measurements
 - It can be used to monitor change over time
 - It might provide data on dangerous, isolated and sensitive areas
 - It can be applied at various scale
59. What is 'parallax'?
- The apparent change in position of an object when viewed from two different positions
 - The term describing systematic striping or banding affecting multispectral scanners
 - The effect of atmosphere on the measured reflectance

- d. The intrinsic projective geometry between two images
60. Which of the following does not describe image resolution?
- Spatial
 - Spectral
 - Energy
 - Temporal
61. Which of the following is not a kind of atmospheric scattering?
- Raleigh scattering
 - Mie scattering
 - Goodchild scattering
 - Non-selective scattering
62. Which of the following is not an image resampling method?
- Nearest neighbour
 - Bilinear interpolation
 - Cubic convolution
 - Brownian circumvolution
63. Which of the following is not measured by an inertial central unit?
- Pitch
 - Roll
 - Yaw
 - Scroll
64. Which of the following Boolean operator will be output "off", if and only if all the inputs are "on"?
- AND
 - NAND
 - XOR
 - NOR
65. Which section of the electromagnetic spectrum corresponds to the visible light spectrum?
- 380 nm – 760 nm
 - 0.2 nm – 0.6 nm
 - 35 nm – 55 nm
 - 8500 – 1230 nm

66. Considering electromagnetic spectrum from the short to long wavelength, which of the following ordered list is correct?
- X-rays, Microwave, Infrared, Visible, Ultraviolet
 - X-rays, Infrared, Visible, Microwave, Ultraviolet
 - Microwave, Infrared, Visible, Ultraviolet, X-rays
 - X-rays, Ultraviolet, Visible, Infrared, microwaves
67. Which of the following is the Normalized Difference Vegetation Index (NDVI)?
- $(NIR - R) / (NIR + R)$
 - NIR / R
 - $(NIR + R) / (NIR - R)$
 - $(NIR * R) / NIR$
68. Which of the following statement is correct?
- Long wavelength has low frequency and low quantum energy
 - Long wavelength has high frequency and low quantum energy
 - Long wavelength has high frequency and high quantum energy
 - Long wavelength has low frequency and high quantum energy
69. In the field of Geomatics, what does SRTM stand for?
- Shuttle Radar Topography Mission
 - Security Requirements Tractability Matrix
 - Stereo Radar Topographic Measurement
 - Stereo Requirements for Topographic Modeling
70. What is "spatial filtering" in remote sensing?
- The process of altering the distribution and range of digital number values of an image to enhance its quality
 - The process of selectively preserving certain pixel frequencies in an image to enhance particular features or edges of objects
 - The process of changing the spatial scale of an image
 - The process of making parts of the image at a different scale to another part of the image
71. Which of the following very high spatial resolution commercial satellites has the best multispectral spatial resolution?
- Ikonos
 - Quickbird
 - Orbview
 - Cartosat-1

0	1	0
1	-4	1
0	1	0

72. Why would you use the above kernel?

- To enhance image contrasts-
- To enhance image edges
- To detect image edges
- To blur the image

0	1	0
1	-4	1
0	1	0

73. To which filter family the above kernel belongs to?

- Laplacian
- Sobel
- Nagao
- Gaussian

74. Radiometric correction consisted in:

- converting pixel values into radiance
- relating the spatial coordinates in the image to the corresponding spatial coordinates on the Earth's surface
- correcting pixel values for atmospheric propagation effects
- changing the shape of the image histogram by reassigning one pixel value to another

75. Which is not a raster distance tool?

- Euclidean distance
- Cost Distance
- Buffers
- Corridor

76. In image processing, an opening consists in:

- Adding any background pixel touching another pixel that is already part of a region
- Removing any pixel touching another pixel that is part of the background
- Combining two morphological operations, namely an erosion followed by a dilatation

- d. Combining two morphological operations, namely a dilatation followed by an erosion

77. In GIS project design and management, what do we mean by “hard systems” approach?

- a. A method to translate a conceptual into a physical data model
- b. A method of selecting the correct hardware for an application
- c. A method for approaching reality by rebuilding part of it
- d. A technique of addressing structured problems

78. In GIS, what is “system life cycle”?

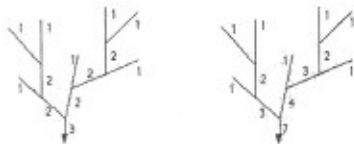
- a. An approach to managing the development and implementation of an IT system
- b. A prototyping approach to IT project management
- c. A method for updating a GIS data model
- d. The life time of a GIS project

79. In RDBM, what does a “tuple” refer to?

- a. A row in a database table
- b. A column in a database table
- c. A virtual table composed of the result set of a query
- d. A set of attributes combined to get a primary key

80. What are Thiessen polygons?

- a. Polygons whose boundaries define the area that is closest to each point relative to all other points
- b. The dual graph of the Voronoi tessellation for a given set of point
- c. The result of a point to polygon transformation
- d. Polygons resulting from a Delaunay triangulation of a set of points



81. The above image represented stream order methods proposed respectively by:

- a. Strahler and Shreve
- b. Strahler and Gustavson
- c. LeGrand and Shreve
- d. Voronoi and Thiessen

82. At which point would you move the greatest distance in the least amount of time?
- At the arctic circle
 - At the equator
 - At the tropic of cancer
 - At the north pole
83. In a false colour infrared image, how would vegetation appear?
- Green
 - Red
 - Blue
 - Yellow
84. Which of the following would you use to measure spatial autocorrelation?
- Moran I
 - Cohen Kappa
 - Student T
 - Mendel P
85. In _____ the theoretical variogram $2\gamma(x,y)$ is a function that describes the degree of spatial dependence of a spatial random field or stochastic process $Z(x)$.
- Computer graphics
 - Spatial analysis
 - Modeling
 - Statistical graphics
86. What does MAS stand for?
- Monolithic Architecture System
 - Multi-Algorithm Search
 - Multi-Algorithm System
 - Muti-Agent System
87. CE90 (Circular Error of 90 %) is commonly used for:
- Characterizing the planimetric accuracy
 - Characterizing the altimetric accuracy
 - Characterizing hysteresis of a satellites
 - Characterizing the long term drift of a satellite
88. Which of the following data sources is better adapted to measure tree height?
- LandSat TM

- b. Insar imagery
- c. Lidar
- d. Ikonos stereo

89. Which of the following is not well suited for analyzing "proximity"?

- a. Thiessen polygon
- b. Buffers
- c. Point distance
- d. Delauney Triangulation

90. Which function would you use to aggregate features based on specified attributes?

- a. Dissolve
- b. Generalize
- c. Eliminate
- d. Simplify

91. Which of the following boolean simply changes the input to the opposite (0 to 1 and 1 to 0)?

- a. NOT
- b. AND
- c. OR
- d. XOR

92. Models consisting in simulating the environment using a grid, a space in which a set of transition rules determine the attribute of each given cell taking into account the attributes of the neighboring cells, are called:

- a. Marked processes
- b. Cellular automata
- c. Neural Networks
- d. Markow chain

93. What are the three basic types of spatial distributions?

- a. Regular – Random - Aggregated
- b. Clustered – Regular - Oriented
- c. Poisson – Random - Aggregated
- d. Clumped – Uniform – Multi-modal

94. What does InSAR stand for?

- a. International Shuttle Altimeter Radar
- b. International Standard Airborne Radar

- c. Interferometric Synthetic Aperture Radar
- d. Interferometric Scattering Airborne Radar

95. What is GLAS?

- a. A scanning Lidar Imager of Canopies by Echo Recovery
- b. A laser-ranging instrument for continuous global observations of Earth aboard the ICESat spacecraft
- c. An airborne eight-channel ranging scatterometer for remote sensing of ecosystems structure
- d. An optical sensor that delivers calibrated images of the upwelling spectral radiance in 224 contiguous spectral channels with wavelengths from 400 to 2500 nm.

96. What is primary data?

- a. Data captured using direct measurement specifically for use in a given project
- b. Original data that hasn't been submitted to any data cleaning and data control procedure
- c. Data collected from various sources for setting up a new geographic information system
- d. Source data, that does not result from calculation or any other data crossing

97. Spatial _____ statistics measure and analyze the degree of dependency among observations in a geographic space.

- a. Fourier transform
- b. Autocorrelation
- c. Wavelet transform
- d. Correlation and dependence

98. Which of the following cannot be directly derived from a DTM?

- a. Slope
- b. Hillshade
- c. Aspect
- d. Flow accumulation

99. What is a Choropleth map?

- a. A thematic map displaying a qualitative attribute
- b. A thematic map that displays a quantitative attribute using ordinal classes
- c. A thematic map that displays nominal attribute using ordinal classes
- d. A thematic map displaying contour lines

100. What is a DSS?

- a. A system, usually computerized, dedicated to supporting decisions regarding a specific problem or set of problems
- b. A set of computer programs for organizing information at the core of which will be a database
- c. A software designed to assist in the process of designing and drafting
- d. A model for which there is one possible answer for a given set of inputs