# ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

## 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 within the box 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 of the 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. A shape file is :
   (A) a file data structure            (B) a file directory
   (C) a raster model                (D) a XML for analyzing shapes

2. What does 20 minutes represent using the latitude and longitude system (degrees, minutes, seconds)
   (A) ¼ hour       (B) 500 seconds       (C) 1/10°           (D) 1/3°

3. You are seeing the sky blue because :
   (A) light is blue
   (B) there are no clouds
   (C) reflection of water from the sea onto the sky
   (D) scattering of light

4. 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

5. Aryabhatta was:
   (A) the first indigenously built Indian satellite
   (B) the philosopher who won the Nobel Prize in India
   (C) the name of an Indian launch vehicle
   (D) the first director of ISRO

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. Which of the following is not a satellite?
   (A) Glas       (B) Landsat       (C) IRS           (D) IKONOS

8. Precise measurement of Earth features can be obtained from :
   (A) High-oblique photographs
   (B) Low-oblique photographs
   (C) Vertical aerial photographs
   (D) All the above types of aerial photographs

9. Lines connecting points of equal air temperature are known as :
   (A) Isohyets
   (B) Isotherms
   (C) Isobars
   (D) Contour Lines

10. In a computer the RAM stands for :
    (A) Root Access Management
    (B) Rough Access Memory
    (C) Range Additional Memory
    (D) Random Access Memory

11. The largest scale of the following is :
    (A) 1 : 15000
    (B) 1 : 6000
    (C) 1 : 1000000
    (D) 1 : 50000

12. In a computer, memory is measured in :
    (A) Radians
    (B) Hertz
    (C) Bytes
    (D) Watts

13. Lines connecting points of equal precipitation are known as :
    (A) Isobars
    (B) Contour Lines
    (C) Isohyets
    (D) None of the above

14. Which of the following remote sensing technologies uses sound?
    (A) Radar
    (B) Thermal infrared imagery
    (C) Sonar
    (D) Hyperspectral imagery

15. The spatial resolution of SRTM data is:
    (A) 90 m
    (B) 10000 m
    (C) 150 m
    (D) 1000 m

16. 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

17. Who was the father of Indian space program?
    (A) Sathish Dhawan
    (B) U.R. Rao
    (C) Bhaskara
    (D) Vikram Sarabhai

18. 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

19. Which of the following is not a raster data structure?
    (A) Block encoding
    (B) Quadtree
    (C) Run-length encoding
    (D) Spaghetti

20. You see an object black because:
    (A) it is a subtractive color
    (B) all the light is absorbed
    (C) all the light is reflected
    (D) it is at the end of the electromagnetic spectrum

21. Which of the following might be considered as the fourth dimension in GIS?
    (A) Space    (B) Scale    (C) Time    (D) Location

22. What does the abbreviation DBMS stand for?
    (A) Digital Base Mapping System
    (B) Database Manipulation Software
    (C) Database Migration System
    (D) Database Management System

23. The shape of a Gaussian distribution is:
    (A) Circular    (B) U-shaped    (C) Bell-shaped    (D) Triangular

24. LIDAR stands for:
    (A) Linear Imaging Data Array
    (B) Least Indexation Data Array
    (C) Light Detection and Ranging
    (D) Lateral Imaging Data Acquisition Range

25. Which is not a subtractive color?
    (A) Pink    (B) Magenta    (C) Cyan    (D) Yellow

26. 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

27. Easting is:
    (A) A linear distance measured eastward from the central meridian of the coordinate system
    (B) East outer limit of the Image
    (C) Shift in the Eastward
    (D) None of the above

131                                                    4

28. 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

29. RMS error stands for:
   (A) Rounded Median Systematic
   (B) Rank Minor Squared
   (C) Range Minimum Standard
   (D) Root Mean Squared

30. 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

31. Orbital shape of a geostationary satellite is always:
   (A) Linear    (B) Circular    (C) Elliptical    (D) Parabolide

32. 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

33. What is true about a geostationary satellite?
   (A) It is always at the same position
   (B) It always looks at the same position
   (C) It has the same speed of Earth rotation
   (D) It has twice the orbital period of the Earth

34. Which of the following overlay methods would you use to calculate the length of a line within a polygon?
   (A) Line-in-polygon    (B) Union
   (C) Point-in-polygon    (D) Intersection

35. What is point-in-polygon overlay?
    (A) A method used to determine which points lay 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

36. A hyperspectral scanner senses:
    (A) in several region of the spectrum
    (B) a few large region of the spectrum
    (C) backscatter energy from its own source
    (D) far regions of the spectrum

37. 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

38. 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

39. INSAT is a:
    (A) geostationary satellite
    (B) polar orbital satellite
    (C) equatorial synchronous satellite
    (D) sun-synchronous satellite

40. Why using 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

41. Compared to green color leaves how do yellow ones appear in near infrared images?
    (A) They look alike
    (B) Yellow ones are darker
    (C) Yellow ones are brighter
    (D) One can not see them at all

42. 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

43. Contour lines on a map represent place having:
    (A) The same latitude                    (B) The same altitude
    (C) The same aspect                      (D) The same pressure

44. A Standard reference point in surveying and Mapping is known as a:
    (A) Spot height                          (B) Bench mark
    (C) Theodolite point                     (D) DGPS point

45. 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

46. In near infrared image, water appears:
    (A) Blue            (B) Red            (C) White            (D) Black

47. 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

48. Union of two polygons corresponds to:
    (A) Their overlapping area               (B) Their non intersecting area
    (C) Their shared boundaries              (D) Both polygons

49. In Geostatistics, the term $\gamma(x, y)$ is called:
    (A) Correlogram                          (B) Semivariogram
    (C) Covariance                           (D) Variogram

50. 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

51. What does EPSG stands for in the field of projection systems?
    (A) European Pineal Study Group
    (B) Ethernet Powerlink Standardization Group
    (C) European Petroleum Survey Group
    (D) Electronic Products and Solutions Group

52. 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

53. 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

54. Which of the following formula is used to convert DMS (Degrees Minutes seconds) to Decimal degrees?
    (A) Decimal degrees = Degrees + (Minutes/60) + (Seconds/60)
    (B) Decimal degrees = Degrees + (Minutes/60) + (Seconds/3600)
    (C) Decimal degrees = (Degrees/60) + (Minutes/60) + (Seconds/3600)
    (D) Decimal degrees = (Degrees/60) + (Minutes/60) + (Seconds/60)

55. 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

56. A map delineating, describing and recording the property boundaries is called a:
    (A) Toposheet
    (B) Cadastral map
    (C) Atlas map
    (D) Photo map

57. 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

58. In database, what is the language used to create and modify the structure of database objects?
    (A) DML
    (B) SQL
    (C) DDL
    (D) IDL

59. A map has a scale of 1:25000. If you measure a distance of 4 cm between two points on the map (on a homogenous plain region), what is the corresponding distance on the ground?

(A) 100 km       (B) 1 km       (C) 10 km       (D) 0.1 km

60. What is a loxodrome?
(A) A map projection used in navigation
(B) A line used in navigation to represent the jet stream 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

61. 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

62. Where is the head quarters of Survey of India located?
(A) Delhi       (B) Pune       (C) Dehradun       (D) Bangalore

63. 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

64. $1°$ latitude at the pole represents approximately :
(A) 50 km       (B) 111 km       (C) 0 km       (D) 90 km

65. How would you qualify the below measurements?
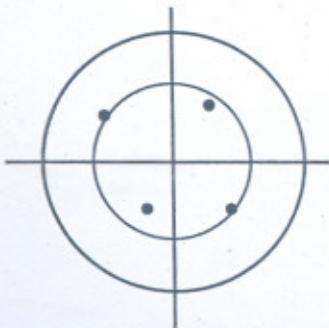


(A) Accurate and precise to define       (B) Inaccurate and imprecise
(C) Inaccurate and precise       (D) Accurate and imprecise

66. Chandrayaan-1, India's first mission to Moon, was launched successfully on October 22, 2008 using, which launch vehicle?
   (A) SLV-3　　(B) PSLV　　(C) GSLV　　(D) ASLV

67. What is the obliquity of the Earth's axis of rotation relative to the ecliptic plane?
   (A) 55°　　(B) 23.5°　　(C) 97.8°　　(D) 3°

68. 1° longitude at the equator represents approximately :
   (A) 27 km　　(B) 63 km　　(C) 111 km　　(D) 180 km

69. If you digitize a 1: 150,000 scale map to an accuracy of ±0.5mm, what would be the level of error in ground units?
   (A) ±0.5 m　　(B) ±75 m　　(C) ±150 m　　(D) ±300 m

70. You need to query a huge relational database. What clause or command would you use to improve the speed of data retrieval operations?
   (A) A "having" clause　　　　　(B) A "group by" clause
   (C) A "index" command　　　　(D) A "alter" command

71. Which of the following is not a database object?
   (A) A table　　　　　　　　　(B) A report
   (C) A relationship　　　　　　(D) None of the above

72. The number 7 in "Landsat 7" represents:
   (A) the number of spectral bands
   (B) the number of solar panels on the payload
   (C) the sequence number in the series of launches
   (D) the number of orbits of the satellite

73. What is 'parallax'?
   (A) The apparent change in position of an object when viewed from two different positions
   (B) The term describing systematic striping or banding affecting multispectral scanners
   (C) The effect of atmosphere on the measured reflectance
   (D) The intrinsic projective geometry between two images

74. What is 0° latitude and 0° longitude?
   (A) The point at which equator and the prime meridian intersect
   (B) The point at which north pole and prime meridian intersect
   (C) The point at pole where the latitude and longitude meet
   (D) The starting position of the prime meridian in England

75. Which of the following is not an image resampling method?
   (A) Nearest neighbor
   (B) Bilinear interpolation
   (C) Cubic convolution
   (D) Brownian circumvolution

76. Which of the following is not measured by an inertial central unit?
   (A) Pitch
   (B) Roll
   (C) Yaw
   (D) Scroll

77. The equator can also be called a:
   (A) prime meridian
   (B) parallel of latitude
   (C) great circle
   (D) both (B) and (C)

78. Which of the following Boolean operator will output "off", if and only if all the inputs are "on"?
   (A) AND
   (B) NAND
   (C) XOR
   (D) NOR

79. Considering electromagnetic spectrum from the short to long wavelength, which of the following ordered list is correct?
   (A) X-rays, Microwave, Infrared, Visible, Ultraviolet
   (B) X-rays, Infrared, Visible, Microwave, Ultraviolet
   (C) Microwave, Infrared, Visible, Ultraviolet, X-rays
   (D) X-rays, Ultraviolet, Visible, Infrared, microwaves

80. Which of the following is the Normalized Difference Vegetation Index (NDVI)?
   (A) (NIR - R) / (NIR + R)
   (B) NIR / R
   (C) (NIR + R) / (NIR - R)
   (D) (NIR * R) / NIR

81. Which of the following statement is correct?
   (A) Long wavelength has low frequency and low quantum energy
   (B) Long wavelength has high frequency and low quantum energy
   (C) Long wavelength has high frequency and high quantum energy
   (D) Long wavelength has low frequency and high quantum energy

82. In the field of Geomatics, what does SRTM stand for?
   (A) Shuttle Radar Topography Mission
   (B) Security Requirements Tractability Matrix
   (C) Stereo Radar Topographic Measurement
   (D) Stereo Requirements for Topographic Modeling

131

83. What is "spatial filtering" in remote sensing?

   (A) The process of altering the distribution and range of digital number values of an image to enhance is quality

   (B) The process of selectively preserving certain pixel frequencies in an image to enhance particular features or edges of objects

   (C) The process of changing the spatial scale of an image

   (D) The process of making parts of the image at a different scale to another part of the image

84.

| 0 | 1 | 0 |
|---|---|---|
| 1 | -4 | 1 |
| 0 | 1 | 0 |

Why would you use the above kernel?

   (A) To enhance image contrasts          (B) To enhance image edges

   (C) To detect image edges               (D) To blur the image

85.

| 0 | 1 | 0 |
|---|---|---|
| 1 | -4 | 1 |
| 0 | 1 | 0 |

To which filter family the above kernel belongs?

   (A) Laplacian       (B) Sobel       (C) Nagao       (D) Gaussian

86. Radiometric correction consisted in:

   (A) converting pixel values into radiance

   (B) relating the spatial coordinates in the image to the corresponding spatial coordinates on the Earth's surface

   (C) correcting pixel values for atmospheric propagation effects

   (D) changing the shape of the image histogram by reassigning one pixel value to another

87. In image processing, an opening consists in:
    (A) Adding any background pixel touching another pixel that is already part of a region
    (B) Removing any pixel touching another pixel that is part of the background
    (C) Combining two morphological operations, namely an erosion followed by a dilatation
    (D) Combining two morphological operations, namely a dilatation followed by an erosion

88. 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
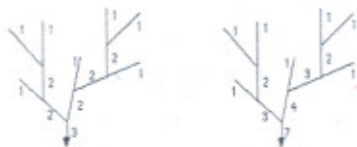


89. The above image represented stream order methods proposed respectively by:
    (A) Strahler and Shreve        (B) Strahler and Gustavson
    (C) LeGrand and Shreve        (D) Voronoi and Thiessen

90. At which point would you move the greatest distance in the least amount of time?
    (A) At the arctic circle        (B) At the equator
    (C) At the tropic of cancer        (D) At the north pole

91. Which of the following is a primary color?
    (A) Brown     (B) Magenta     (C) Purple     (D) Red

92. Which of the following would you use to measure spatial autocorrelation?
    (A) Moran I        (B) Cohen Kappa
    (C) Student T        (D) Mendel P

93. 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 $Z(x)$.
    (A) Computer graphics        (B) Spatial analysis
    (C) Modeling        (D) Statistical graphics

94. CE90 (Circular Error of 90 %) is commonly used for:
   (A) Characterizing the planimetric accuracy
   (B) Characterizing the altimetric accuracy
   (C) Characterizing hysteresis of a satellites
   (D) Characterizing the long term drift of a satellite

95. Which of the following data sources is better adapted to measure tree height?
   (A) LandSat TM                    (B) Insar imagery
   (C) Lidar                         (D) Ikonos stereo

96. Photogrammetry refers to:
   (A) the science of measuring objects from photos
   (B) the science of taking pictures
   (C) a method for studying photons
   (D) a method for correlating electromagnetic waveforms

97. Which function would you use to aggregates features based on specified attributes?
   (A) Dissolve       (B) Generalize       (C) Eliminate       (D) Simplify

98. 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

99. 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

100. 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