

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2021
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR GEOGRAPHIC INFORMATION SYSTEM

Date	: October 31, 2021
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 4 Short Answer QuestionsAll questions under SECTION A are COMPULSORY.
- **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part on a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **6 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Which of the following is not an example of spatial data?
 - a) Points showing location of discrete objects.
 - b) Lines showing routes.
 - c) Times of events.
 - d) Polygon showing area covered by a particular variable.

2. When a GIS dataset for a given project is constantly revised, accessed, and manipulated by multiple users, the best practice approach for storing the data is (choose the best response)
 - a) Shape files
 - b) Personal Geodatabase
 - c) KML files
 - d) Enterprise Geodatabase

3. Which of the following is the correct definition of Scale?
 - a) An indication of how big an object represented on the map is on the ground.
 - b) The ratio of a distance on a map to the corresponding distance on the ground.
 - c) The conversion factor used to transform map projection.
 - d) The order of level of generalization at which phenomenon exists or are observed.

4. What does 1mm on a map drawn at a scale of 1:50,000 represent on the ground?
 - a) 50 centimeters
 - b) 500 centimeters
 - c) 5 meters
 - d) 50 meters

5. A small-scale map would show (choose the best response)
 - a) a larger geographic area than a large-scale map.
 - b) a smaller geographic area than a large-scale map.
 - c) the same geographic area as a large-scale map, just at a smaller resolution.
 - d) the same geographic area as a large-scale map, just at a larger resolution.

6. Which of the following is not a type of map projection?
 - a) Conic
 - b) Cylindrical
 - c) Geographic
 - d) Azimuthal

7. The Mercator projection is an example of cylindrical projection.
 - a) True
 - b) False

8. The map projection used in Drukref03 grid is
 - a) Polyconic
 - b) Transverse Mercator
 - c) Lamberts conformal conic
 - d) Conic

9. Which of the following represents the correct set of coordinate classification in GIS?
 - a) Spherical, projected systems
 - b) Geographic, projected systems
 - c) Geographic, spherical systems
 - d) Geographic, geometric systems

10. Which of the following is not a property of coordinates in GIS?
 - a) Line of sight
 - b) Origin
 - c) Axis
 - d) Units of measurement

11. GPS uses
 - a) Geo-centric coordinate system
 - b) Plane coordinate system
 - c) Cartesian coordinate system
 - d) Geodetic coordinate system

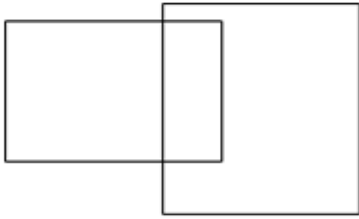
12. What is a datum?
 - a) A mathematical model.
 - b) The mathematical model related to real world features.
 - c) Real world features projected with minimum distortion from a round earth to flat map.
 - d) A system of coordinates.

13. The line of latitudes and longitudes are very important because they are
 - a) imaginary lines.
 - b) used to find the exact location of a place.
 - c) used to divide the earth into heat zones.
 - d) semi-circles and circles.

14. Bhutan lies between the latitudes of
 - a) $26^{\circ} 40'$ and $28^{\circ} 20'N$
 - b) $26^{\circ}20'$ and $28^{\circ} 20'N$
 - c) $27^{\circ} 40'$ and $28^{\circ} 20'N$
 - d) $25^{\circ} 40'$ and $28^{\circ} 20'N$

15. The fundamental principle which refers to the fact that locations that are closer together are more likely to have similar values than locations that are far apart is commonly referred to as
 - a) Tobler's first law of Geography
 - b) Kepler's first law of Geography
 - c) Anthony's first law of Geography
 - d) Thompson's first law of Geography

16. The figure represents which type of error in GIS?



- a) Pseudo node
 - b) Silver polygon
 - c) Dongle node
 - d) Poly line feature
17. The point data feature can be used to represent
- a) Location
 - b) Area
 - c) 3D area
 - d) Volume
18. GIS deals with which kind of data?
- a) Numeric data
 - b) Binary data
 - c) Spatial data
 - d) Complex data
19. Which of the following is an example of map generalization?
- a) Buffering
 - b) Coordinate transformation
 - c) Polygon Overlay
 - d) Polygon Coordinate thinning
20. Uniform cell size is a description of a (choose the best response)
- a) Raster data structure
 - b) Vector data structure
 - c) Point data structure
 - d) Polygon data structure
21. The process of using known values of a point to estimate the value of unknown points in the same or nearby region is called
- a) Spatial interpolation
 - b) Spatial prediction
 - c) Spatial adjustment
 - d) Spatial estimation
22. Resampling of a raster image
- a) Increases the accuracy
 - b) Increases the precision
 - c) Decreases data details
 - d) Increases data details

23. TIN stands for
- Traffic Internet Network
 - Triangulated Irregular Network
 - Temporal Interest Network
 - Temperature Interface Node
24. Fields can be
- Discrete only
 - Continuous only
 - Discrete or continuous
 - None of the above
25. Which of the following statements are true?
- Natural phenomena are usually *fields*.
 - Man-made phenomena are usually *objects*.
 - Both a) and b) are true.
 - None of the above.
26. Population forecast can be done by using GIS.
- False
 - True
27. Which one of the following is not a type of image resolution?
- Temporal
 - Reflectance
 - Spatial
 - Spectral
28. The method used to align an unreferenced dataset with one that has spatial reference information is called
- Scaling
 - Reprojecting
 - Georeferencing
 - Defining projections
29. What does SDI stands for?
- Spatial Data Interface
 - Spatial Data Infrastructure
 - Spatial Data Intention
 - Spatial Data International
30. What is the name of the Open GIS Consortium's XML-based universal data standard?
- GML
 - Html
 - KML
 - SDTS

PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

1. What is the difference between raster and vector data structures? Explain how data is collected and stored in the different structures. Give an example of each
2. Discuss the various components of GIS in detail.
3. What is a Map Projection? Explain how to choose a proper projection.
4. What are the sources of error and uncertainty in spatial data? How and when is uncertainty introduced into the data? What can be done to avoid it?

SECTION B: Case Study [50 marks]

Choose either CASE I OR CASE II from this section. Each case study carries 50 marks.

CASE I

Land is a scarce resource in Bhutan. As a rugged country in the Himalayas, most of it is unusable. The Constitution of the Kingdom of Bhutan also stipulates that at least 60% of the country's geographical area has to be maintained under forest cover for all times to come. There are many protected areas in the form of parks, wildlife sanctuaries and biological corridors, where development is prohibited. There is tremendous amount of pressure on whatever land is available for development by various sectors.

Given this acute scarcity of land and intense competition for access to land, it is important to formulate a long-term and strategic national land use plan in order to achieve the national objectives such as safeguarding the sovereignty, territorial integrity, conservation of culture and environment and achieving balanced and sustainable economic development.

Elaborate how Geographic Information System can be used as a tool to contribute towards formulation of a national land use plan.

CASE II

Thimphu City is yet to have a Street Addressing System (SAS) in place. In the absence of a SAS, it is extremely difficult to locate services and navigate to points of interests, particularly as the city gets more congested. A lot of time and other resources are wasted in trying to get to the desired locations. Rapidly developing e-commerce and associated delivery services also demand an accurate SAS for efficient delivery.

Propose the role of GIS and associated technologies in developing a SAS for Thimphu City.

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