

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2019
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR GEOGRAPHIC INFORMATION SYSTEM

Date	: October 13, 2019
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 in 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 are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 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. 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.

2. GIS deals with which kind of data?
 - a) Numeric data
 - b) Binary data
 - c) Spatial data
 - d) Complex data

3. Which of the following statements is true about the capabilities of GIS?
 - a) Data capture and preparation.
 - b) Data management, including storage and maintenance.
 - c) Data manipulation and analysis.
 - d) All of the above.

4. Principle of surveying followed to prevent accumulation of error is
 - a) to work from whole to part.
 - b) to work from part to whole.
 - c) both (a) and (b).
 - d) None of the above.

5. By 'spatial data' we mean data that has
 - a) complex values.
 - b) positional values.
 - c) graphic values.
 - d) decimal values.

6. 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 $28^{\circ} 20'N$

7. Geo-referencing refers to
 - a) relating spatial with non-spatial data.
 - b) geodetic network adjustment.
 - c) linking spatial information to a coordinate system.
 - d) defining four corners of a map.

8. What is 'Metadata'?
 - a) It is 'data about data'
 - b) It is 'meteorological data'
 - c) It is 'oceanic data'
 - d) It is 'contour data'

9. Key components of 'spatial data' quality include
 - a) positional accuracy.
 - b) temporal accuracy.
 - c) lineage and completeness.
 - d) All of the above.

10. Interpolation is made possible by a principle called
 - a) spatial autocorrelation.
 - b) spatial auto-correction.
 - c) thematic autocorrelation.
 - d) thematic auto-correction.

11. The map projection used in Drukref Grid is
 - a) polyconic.
 - b) transverse mercator.
 - c) lamberts conformal conic.
 - d) conic.

12. The DRUKREF 03, the National Geodetic Reference Datum in Bhutan is equivalent to
 - a) new everest.
 - b) transverse mercator.
 - c) lambert conformal conic.
 - d) WGS84.

13. GIS differs from surveying and mapping by introducing
 - a) attribute descriptions.
 - b) spatial analysis.
 - c) location determination.
 - d) temporal information.

14. GPS uses
 - a) geo-centric coordinate system.
 - b) plane coordinate system.
 - c) cartesian coordinate system.
 - d) geodetic coordinate system.

15. What does the TIN stands for?
 - a) Traffic Internet Network
 - b) Triangulated Irregular Network
 - c) Temporal Interest Network
 - d) Temperature Interface Node

16. The vertical distance between two adjacent contours is called as
- contour interval.
 - contour gradient.
 - contour gap.
 - vertical equivalent.
17. Which of the following scale of survey is large scale survey?
- 1: 1000000
 - 1: 5000000
 - 1:5000
 - 1:100000
18. _____ generally refers to the spatial arrangement among geographic objects and may be managed within a geographic information system through the application of rules such as "Adjacent to" or "may not have gaps".
- Topography
 - Topology
 - Proximity
 - Connectedness
19. When the contour lines touch each other, it indicates a
- level surface.
 - vertical cliff.
 - horizontal surface.
 - slope surface.
20. Geo-database can be a
- collection of geographic datasets of various types in a common file system folder.
 - collection of maps and information.
 - GIS
 - ICT
21. What does SDI stands for?
- Spatial Data Interface
 - Spatial Data Infrastructure
 - Spatial Data Intention
 - Spatial Data International
22. DBMS stands for
- Database Management System
 - Database Monitoring System
 - Database Manufacturing System
 - Database Mixing Station

23. What is a datum?
- A mathematical model.
 - The mathematical model related to real world features.
 - Real world features projected with minimum distortion from a round earth to flat map.
 - A system of coordinates.
24. Which method is used to align an unreferenced dataset with one that has spatial reference information?
- Scaling
 - Re-projecting
 - Georeferencing
 - Defining projections
25. If you are making a web map of sampling locations, streams and watershed areas, in what order would you place the layers on the map?
- Sampling locations, wetland areas, streams.
 - Streams, wetland areas, sampling locations.
 - Sampling locations, streams, wetland areas.
 - It doesn't matter what order they are in.
26. What does a small-scale map would show?
- A larger geographic area than a large-scale map.
 - A smaller geographic area than a large-scale map.
 - The same geographic area as a large-scale map, just at a smaller resolution.
 - The same geographic area as a large-scale map, just at a larger resolution.
27. 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 answer)
- Shapefiles
 - Personal Geodatabase
 - KML files
 - Enterprise Geodatabase
28. Which of the following appends together layers of adjoining area? (Choose the best response)
- Join
 - Merge
 - Union
 - Clip
29. What does acronym GNSS stand for?
- Global National Satellite System
 - Global Navigation Satellite System
 - Global Navstar Satellite System
 - Global Navy Satellite System

30. The process of using data points with known values to estimate values at unknown points (in same region or nearby region) is called spatial _____.
- a) prediction
 - b) interpolation
 - c) adjustment
 - d) reflection

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 GIS? How is GIS related to remote sensing? Explain few applications of GIS and remote sensing in the context of Bhutan?
2. Differentiate between vector and raster data in GIS. What is digital elevation model (DEM)? How is it different from digital surface model (DSM)?
3. What is the difference between spatial resolution and temporal resolution? Explain.
4. As a GIS professional which GIS software do you prefer, a proprietary software or open source software? Give reasons? Name few proprietary and open source GIS software's you know.

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 precious resource of a country. In the Bhutanese context, land is a scarce resource owing to the size of the country and physical terrain. Whatever limited land that Bhutan has is being used for agricultural, commercial, industrial, residential and environmental uses. There is a need to pursue spatial zoning whereby the entire country is being zoned into various land uses to guide strategic use of limited land in the future.

Discuss how the technology of Geographic Information System and related fields such as surveying and remote sensing be utilized to pursue the goal of national spatial zoning.

CASE II

Recently there was an outbreak of dengue in various parts of the country claiming lives in some cases.

Discuss how you will design a project to:

1. Map the outbreak of dengue.
2. If the outbreak has been related to hot climate and presence of stagnant water among others, how will you use spatial analysis techniques to prove the causality?
3. What policy recommendations will you submit to the government to mitigate the outbreak of dengue in future?

TASHI DELEK