**ROYAL CIVIL SERVICE COMMISSION**

**CIVIL SERVICE COMMON EXAMINATION (CSCE) 2009**

**EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for *Survey Engineering***

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Date: 8th November 2009

Full Marks: 100

Time: 2hrs 30min

Reading Time: 15 minutes (prior to exam time)

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**Guidelines for this paper:**

1. This question paper consists of ***10 pages*** including this one.
2. It is ***Mandatory*** to write all the answers in the answer sheet you will be provided.
3. **Section A is divided into 2 parts**:

   **Part I:** contains ***30 questions*** with multiple choice answers. Write down the corresponding question number and the letter of the selected answer **(eg. 1/a)** in the given answer sheet only. Answers marked in the question paper will not be evaluated. All questions are mandatory. Each question carries 1 mark. ***Total 30 Marks.***

   **Part II:** consists of ***4 questions*** which expect short answers. Each question carries 5 marks. ***Total 20 Marks.***
4. **Section B**: contains 2 case studies. Attempt any one. The question carries **50 Marks.**

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**Good Luck !**

## SECTION A: Part I

Answer all questions. Each question carries 1 mark. Total 30 marks.

1. The two conceptual representation used in GIS are:
   a) Grid and Raster
   b) Grid and Vector
   c) Vector and Coverage
   d) CAD and Shapefile

2. In the electromagnetic spectrum the wavelength 0.4 µm – 0.7 µm corresponds to:
   a) Radio wave spectrum
   b) Infra-red spectrum
   c) Micro wave spectrum
   d) Visible Spectrum

3. The flattening '*f*' of the spheroid is given by the formula:
   a) f = (b-a)/b
   b) f = (b-a)/a
   c) f = (a-b)/a
   d) f = (a-b)/b

4. Which map projection has the following properties:
   - It's a cylindrical projection with cylinder longitudinal along a meridian instead of equator
   - It is a conformal projection
   - Does not maintain true direction
   - Central meridian is placed in the center of the region of interest

   a) UTM projection
   b) Transverse Mercator Projection
   c) Mercator Projection
   d) Mollweide Projection

5. Which of the following statement is **TRUE** with regard to the digital aerial camera:
   a) Requires the measurement of 4 fudicial marks for interior orientation
   b) Does not have fudicial marks
   c) Requires the measurement of 8 fudicial marks for interior orientation
   d) No interior orientation is required

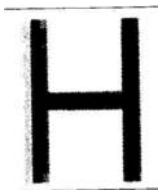
6. In leveling, the errors due to refraction is usually eliminated by:

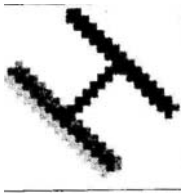
   a) Equalizing the lengths of backsights and foresights
   b) Focusing properly
   c) Taking readings two times
   d) Increasing the height of the staff

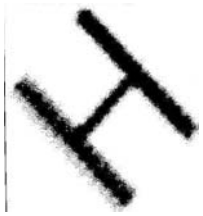
7. Modernization of GPS includes
   a) Introduction of Selective Availability
   b) Making the L2 available to civilian users
   c) Introduction of L2C, and L5 frequency for civilian users
   d) Launching of more GPS Satellites

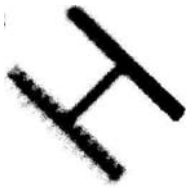
8. An aerial photograph was exposed with a 150 mm focal length camera at a flying height above MSL of 3000 m. What is the photo scale at point *A* if the elevation of point *A* on the ground is 900 m above MSL?
   a) 1: 15000
   b) 1: 10000
   c) 1: 12000
   d) 1: 14000

9. The effect of Nearest Neighbor resampling method is illustrated by:

a) 

b) 

c) 

d) 

10. The combined scale factor which allows to move directly between grid and ground distances is given by:
    a) map projection scale factor – height scale factor
    b) map projection scale factor + height scale factor
    c) map projection scale factor / height scale factor
    d) map projection scale factor x height scale factor

11. The standard approach adopted by all digital photogrammetric software for automatic DTM generation is:
    a) Image Segmentation
    b) Image Matching
    c) Histogram Matching
    d) Region Growing

12. The main objective for standardization and feature coding based on standard is to
    a) facilitate interoperability and data exchange
    b) facilitate development of data model
    c) facilitate development of data standards
    d) facilitate development of standardized database

13. From the formula h=H+N one can determine the:
    a) Geoid
    b) MSL
    c) Geoidal Undulation
    d) Ellipsoid

14. The relative geometric strength of a GPS position determination can be expressed quantitatively using a term called:
    a) HDOP
    b) GDOP
    c) VDOP
    d) PDOP

15. The condition in which the exposure stations, any object point and its photo image all lying along a straight line in 3D space is:
    a) Coplanarity condition
    b) Space Resection
    c) Collinearity condition
    d) Triangulation

16. The parameters of Affine transformation are:
    a) 2 shifts, different rotation for each axis, different scale factor for each axis
    b) 2 shifts, same rotation for each axis, same scale for each axis
    c) 3 shifts and 3 rotations
    d) 2 shifts, 3 rotations and 1 scale factor

17. The description of the relative location of geographic phenomena independent of their exact location is termed
    a) Georeferencing
    b) Topology
    c) Geocoding
    d) Registration

18. Which of the following is NOT an active remote sensing sensor?
    a) RADAR
    b) LIDAR
    c) SONAR
    d) Aerial Camera

19. The principal of GPS surveying is similar to
    a) Rectangulation
    b) Triangulation
    c) Traverse
    d) Resection

20. The orientation of high resolution satellite imagery is carried out with
    a) Rigorous Sensor Model
    b) General Sensor Model
    c) Replacement Sensor Model
    d) Physical Sensor Model

21. In cartographic process which one of the following is a geometrical quantitative generalization?
    a) Classify
    b) Symbolize
    c) Highlight
    d) Aggregate

22. Slope distance measured by EDM is reduced to horizontal distance by observing the
    a) Horizontal angle
    b) Included angle
    c) Vertical angle
    d) Zenith angle

23. Relief displacement in an aerial photograph is:
    a) radially outward from the principal point
    b) radially inward from the principal point
    c) radially downward from the principal point
    d) radially upward from the principal point

24. In UTM projection what will be the scale factor at 180 km east and west of and parallel to the central meridian?
    a) 1
    b) 1.5
    c) 0.9996
    d) 0.99996

25. The focal length of the Wide Angle camera is:
    a) 85 mm
    b) 210 mm
    c) 306 mm
    d) 153 mm

26. Which error has cumulative effect and can be eliminated by applying corrections:
    a) Mistakes
    b) Systematic Errors
    c) Random Errors
    d) Blunders

27. One of the difference between CAD and GIS data is:
    a) CAD usually has no database to store attribute where as GIS data has database to store attributes
    b) Both CAD and GIS data requires database to store attribute
    c) GIS data usually has no database to store attribute where as in CAD attributes are stored in database
    d) Both CAD and GIS data does not require database to store attribute

28. A mathematical model representing terrain without structures and vegetation is a
    a) DHM
    b) DSM
    c) DTM
    d) DEM

29. A satellite image has 0.50 m ground sampling distance, what does it refer to:
    a) Spatial Resolution
    b) Spectral resolution
    c) Radiometric resolution
    d) Temporal Resolution

30. In a theodolite, which error is avoided by carrying out measurement in two phases?
    a) Human Error
    b) Centering error
    c) Levelling error
    d) Collimation

## Section A: Part II

It is mandatory to answer all questions. Each question carries 5 marks. Total 20 Marks.

**Question 1**

Explain the difference between Transformation and Conversion and give example for each.

**Question 2**

Which factors influence the quality of a digital orthophoto. Name at least 3 of them and Explain.

**Question 3**

Explain the general data structures for Raster and Vector GIS and discuss the pros and cons of both approaches.

**Question 4**

Outline the sources of errors in GPS surveying and which one is minimized with the differential processing method.

## Section B

**Question 1**

Many agricultural land used for rice cultivation around the country has been lost to the developmental activities. In order to maintain reasonable area under rice cultivation the Ministry of Agriculture wants suitability analysis to be carried out. Some of the optimal conditions identified for growing rice are ph values of 2.0 to 4.0, a soil depth of at least 0.6 m, and a slope of 2 to 5 % with exposure to the south west.

As input you have a DEM with 20 m resolution and a number of locations where the ph values and the soil depth has been measured. What additional input data do you need for the suitability analysis study?

Describe the steps necessary to find the suitable area for rice cultivation based on GIS analysis. Which method would you choose for analysis, Raster or Vector? Justify.

**Question 2**

The current policy of the Royal Government for the socio-economic development of the country is to generate 10,000 MW of electricity in the $10^{th}$ FYP by setting up numerous hydro-power plants across the major rivers of the country. Prefeasibility study needs to be carried out for the projects where preparing of the site topographic map has been assigned to the Department of Survey. The area identified is undulating where 40% of the area is covered with tall trees and undergrowth of about 1 meter and the remaining with sparse vegetation and open fields.

The requirement of the client is topographic maps on 1:10,000 scale with 5 and 10 m contour intervals. You have been asked to prepare a detailed plan for carrying out the assignment. Justify the chosen and the rejected options in accomplishing the task and outline the timeframe. Take in account the existing infrastructure and the technical capabilities within the Department.