

**Technical Graduates Selection Examination  
General Guidelines**

**PAPER III: SURVEYING**

Date: 20<sup>th</sup> December 2008  
Time: 2hrs 30min  
Full Marks: 100

**Guidelines for this paper:**

1. This question paper consists of 8 pages including this one
2. It is **mandatory** to write all the answer in the answer sheet you will be provided
3. **Section A** contains 30 questions with multiple choice answer. Write down the corresponding number and letter of the selected answer ( eg. 25/ a) in the given answer sheet. All questions are mandatory. Each question carries 1 mark.  
Total 30 marks
4. **Section B**, consists of 4 questions which expect short answers. Each question carries 5 marks. (Total 20 marks)
5. **Section C**, contains 2 case studies. Attempt any one. The question carries 50 Marks

Good Luck!

## SECTION A

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

1. Of the following pair of ellipsoids, which has the most identical geometric definition?
  - a) Everest 1930 and Drukref 03
  - b) Everest 1930 and WGS84
  - c) GRS80 and Clarke 1880
  - d) GRS80 and Drukref 03
  
2. Why does GPS height need to be corrected before use?
  - a) Because GPS height is not referenced to any datum
  - b) Because GPS height is not referenced to the geoid
  - c) Because GPS height is the same as MSL height
  - d) Because GPS height is subject to selective availability (SA).
  
3. Which imaging satellite does not acquire image in the multi-spectral mode:
  - a) IKONOS
  - b) Quickbird
  - c) SPOT
  - d) Cartosat
  
4. In remote sensing, which amongst the following is not a radiometric correction?
  - a) Effects due to sensor sensitivity
  - b) Sun angle and topography
  - c) Atmospheric correction
  - d) Attitude of the sensor
  
5. In a theodolite, what error do you avoid by carrying out observation on two phases.
  - a) Collimation
  - b) Levelling error
  - c) Human error
  - d) Centering error
  
6. The wavelength of the electromagnetic spectrum which is normally used for satellite imaging corresponds to
  - a) 0 to 0.3  $\mu\text{m}$
  - b) 0.4  $\mu\text{m}$  - 0.9  $\mu\text{m}$
  - c) .9  $\mu\text{m}$  - 1mm
  - d) 1mm - 1m

7. In a satellite image the statement “the resolution of the image 2.5 m” refers to what?
- Spatial resolution
  - Spectral resolution
  - Temporal resolution
  - Non of the above
8. In Photogrammetry what is the Principle Point?
- Exact point where the optical axis of the camera was pointing at the instant of exposure
  - The centre of the photograph
  - Fiducial mark
  - Prepointed control mark visible on the photograph
9. Which of the following statements is not true.
- Gravity data is used to determining a shape of the earth from a gravimetric point of view.
  - Gravity data is used to estimating subsurface construction with gravitational distribution over the surface.
  - Gravity data is used to study the variations of the geomagnetic field.
  - Gravity data is used for studying crustal movement associated with seismic or volcanic activity.
10. Which comparison of EDM and GPS process is correct?
- EDM and GPS signals are both reflected back to their source
  - EDM measurements require atmospheric correction, GPS ranges do not
  - EDM and GPS satellites both transmit modulated carriers
  - Phase differencing is used in EDM measurement but not in GP
11. The principal of GPS surveying is more akin to
- Trilateration
  - Triangulation
  - Traverse
  - Rectangulation
12. In GPS, which statement is true?
- A low DOP factor is good, a high DOP factor is bad.
  - A high DOP factor is good, a low DOP factor is bad.
  - A high DOP factor means good satellite configuration
  - Crowded satellites in one part of the sky yields low DOP factor.

13. Assuming flat terrain, if the flying height of an aircraft is 3800m and the focal length is 152mm what is the scale of photography?
- a) 1:50000
  - b) 1:25000
  - c) 1:15000
  - d) 1:12500
14. What is a robotic total station
- a) One which is mounted on a robot
  - b) One which can be remotely controlled
  - c) One which can be preprogrammed
  - d) None of the above
15. During the differential processing, which error is minimized but not totally removed.
- a) clock bias
  - b) ionospheric effect
  - c) orbital error
  - d) code encryption
16. In the UTM projection the scale factor at the central meridian is
- a) 0.99996
  - b) 1.0
  - c) 1.5
  - d) 0.9996
17. Zoning of land use is done to:
- a) create environment awareness amongst the public
  - b) control the physical development and use of land
  - c) speed up the land transaction processes
  - d) establish relationship between the urban and rural land holdings
18. A geo-database can be a :
- a) collection of geographic datasets of various types in a common file system folder
  - b) collection of maps and information
  - c) GIS
  - d) ICT

19. In an EDM measurement 'phase shift' represents the
- The fractional part of the modulated carrier wave as compared to the reference wave which completes the double distance
  - The difference in wavelength between the reference wave and the modulated carrier wave.
  - Number of full wavelengths the modulated carrier has completed
  - None of the above
20. The flattening ' $f$ ' of the spheroid (earth) is given by the formula:
- $f = (b-a)/b$
  - $f = (a-b)/a$
  - $f = (a-b)/b$
  - $f = (b-a)/a$
21. In surveying redundant measurements are taken for:
- independent check
  - testing the instrument
  - controlling the weather effect
  - least square adjustment
22. Random errors in surveying means:
- accidental or casual errors
  - error due to carelessness
  - error that occurs with the same sign
  - periodic errors
23. Relief displacement of vertical objects in an aerial photograph is:
- radially outward from the principal point
  - radially inwards from the principal point
  - radially upwards from the principal point
  - radially downwards from the principal point
24. The visual variables of cartographic symbolization are
- Size, shape, quantity and quality
  - Points, lines and areas
  - Color value, color hue, color intensity and texture
  - Squares, triangles and circles

25. What is the area included by the set of three coordinates  $(-1,0)$ ,  $(1,5)$ ,  $(6,7)$
- a) 45
  - b) 12.5
  - c) 22.5
  - d) 30
26. In leveling, the effect of the earth's curvature is removed by
- a) taking reading above 10 cm from ground
  - b) keeping equal fore and back legs
  - c) taking reading two times
  - d) focusing properly
27. Which term is used to refer to GPS, GLONASS and GALILEO cumulatively?
- a) GNSS
  - b) EGNOS
  - c) WAAS
  - d) SBAS
28. The origin of height is derived from a:
- a) Tidal station
  - b) Gravity station
  - c) Geomagnetic station
  - d) High order Bench mark
29. The type of printing normally adopted for Map printing is
- a) Letterpress printing,
  - b) Intaglio printing,
  - c) Lithographic printing,
  - d) Stencil printing.
30. The Transverse projection subscribes to which class of map projection
- a) Azimuthal projection
  - b) Cylindrical projection
  - c) Conical project
  - d) Stereographic

## SECTION B

(It is mandatory to answer all questions. Each question carries 5 marks. Total 20%)

### Question 1

Explain with the help of diagram how you would derive the height of an object from a single vertical photograph given the flying height of the aircraft?

### Question 2

Explain briefly with illustration any five different aspects of cartographic generalization?

### Question 3 (Answer both 'a' and 'b')

- a. In remote sensing what is the difference between Passive and Active sensor?(2 marks)
- b. What is a geostationary satellite and how is it used? Give an example of a geostationary satellite.(3 marks)

### Question 4 (Answer both 'a' and 'b')

You are asked to carry out a detail survey with 1m contour interval in a deep gorge for a hydro power project.

- a. How would you establish the control? (2 marks)
- b. Explain briefly the choice of instruments you would make for the detail survey. (3 marks)

## Section C

Answer any one of the following questions: Marks 50%

### Question 1

The northern belt, comprising about 15% of the country's area, with elevation of the terrain ranging from 3000m to 7500m above MSL, has been the source of major disasters in the form of Glacial Lake Outburst Floods(GLOFs) in recent years. Due to the persistent global warming, there are reports that other lakes forming from the melting glacier could burst, causing very severe damage to life, property and environment in the populated valleys downstream. To facilitate the agencies working with disaster monitoring and management with a spatial context for their activities, the Survey Department has been directed by the government to prepare a topographic base map of the area with special emphasis on the glaciers, glacial lakes, elevation and access. The existing analogue 1:100000 scale topographic map from 1950 has been deemed unusable for the purpose. Due to the gravity of the situation the task is to be completed within one and half year starting January 2009. The department has been asked to select an appropriate scale for the base map.

The area is accessible only for four months in a year from June to September. Aerial photography has been ruled out due to fear of straying out of our air space.

You are asked to prepare a technical proposal/plan of action to accomplish the task, justifying the technical processes you have opted. (Hint: Begin by firstly analyzing the probable user requirements and identifying the primary data and scale.)

### Question 2

The Thimphu City Corporation's(TCC) land fill site at Memelakha can no longer accommodate any more solid waste. The TCC is desperately looking for alternate site and has approached the Survey Department for assistance in identifying another site. You have been assigned to help the TCC.

Initially two conditions are fixed by TCC. The area of the new site should be at least 3 acres. It is necessary that the soil type must be clay so that there is no seepage from the land fill.

However you know that the two given conditions are far from adequate to arrive at a reasonable conclusion.

- a. Using your common sense determine and qualify at least three other relevant conditions which could help you further refine the site selection.
- b. Now assuming that you have at least five parameters, outline your preparatory actions.
- c. Describe in a logical order, how you would carry out the site selection in a GIS environment based on the established criteria.

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