2311/303
2312/303
PHOTOGRAMMETRY AND
REMOTE SENSING
Oct./Nov. 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN CARTOGRAPHY
DIPLOMA IN LAND SURVEYING

PHOTOGRAMMETRY AND REMOTE SENSING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
  Answer booklet;
  Scientific calculator.
*Answer **FIVE** of the following **EIGHT** questions in the answer booklet provided.*
All questions carry equal marks.
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

**Candidates should check the question paper to ascertain that all
the pages are printed as indicated and that no questions are missing.**

1. (a) Outline the applications of photogrammetry in:

   (i) geology;
   (ii) agriculture;
   (iii) cadastral mapping.

   (6 marks)

   (b) Define the term 'camera accessory'. (1 mark)

   (c) Outline the functions of the following camera accessories:

   (i) exposure meter;
   (ii) intervalometer;
   (iii) camera mount.

   (6 marks)

   (d) (i) Outline the cause of image motion.

   (ii) Aerial photography is to be taken with an aircraft of speed 360 km/hr at a scale of 1:10,000. Select the shutter speed that will produce less image motion between 1/50 s and 1/500 s, justifying the answer. (7 marks)

2. (a) Distinguish between:

   (i) vertical and oblique photographs.
   (ii) Tilt and relief displacement.

   (8 marks)

   (b) Outline **three** methods of determining scale on a vertical aerial photograph.

   (6 marks)

   (c) An aerial photo with a format 230 mm by 230 mm was taken with a camera of focal length 153.31 mm, at a flying height of 4500 m above datum. If the average ground height is 1125 m above datum, compute the ground area covered by one photo in hectares. (6 marks)

3. (a) Distinguish between conventional and differential rectification. (4 marks)

   (b) With the aid of a diagram, prove the theory of an harmonic/cross ratios. (16 marks)

4. (a) Classify analogue plotters according to the range of work. (6 marks)

   (b) With reference to the six (6) standard points, describe the procedure for relative orientation using the two projector method on an analogue stereoplotter. (14 marks)

2311/303
2312/303
Oct./Nov. 2021

5. (a) State **five** sources of errors in radial line triangulation. (5 marks)

(b) Outline **three** advantages of orthophotomaps over topographical maps. (6 marks)

(c) Distinguish between monocular and stereoscopic image analysis. (4 marks)

(d) The initial machine base measures 145 mm while the model distance between two points 'a' and 'b' was measured as 57 cm. Calculate the new machine base to fit the model onto the map whose map points A and B are 61 cm apart. (5 marks)

6. (a) Define the following terms as used in stereoscopy:

(i) stereomodel;
(ii) photobase;
(iii) Y parallel;;
(iv) airbase;
(v) stereogram;
(vi) binoclular vision.

(6 marks)

(b) A pair of vertical photographs taken at a flying height of 2500 m above datum contain images of ground points A and B. The photo bases were measured as 89.9 mm and 90.1 mm respectively. Given the information on **table 1**, calculate the height of point B.

(10 marks)

Table 1

Point	Parallax bar readings (mm)	Height (m)
Left P.P.	9.31	
Right P.P	9.33	
Point A	7.58	755
Point B	8.01	?

(c) Distinguish between stereo image alternator and anaglyphic methods of image separation. (4 marks)

7. (a) Outline the following terms as used in remote sensing:

(i) black body;
(ii) digital image data;
(iii) ground truth;
(iv) ground resolution.

(12 marks)

(b) Illustrate the electromagnetic spectrum, indicating the main regions used in Remote Sensing. (8 marks)

8. (a) (i) State Wien's displacement law.

(ii) Calculate the earth's ambient temperature in °C given that maximum spectral radiant existence occurs at 9.7 μm. (7 marks)

(b) Explain the following energy interactions with earth's atmosphere:

(i) Mie scatter;
(ii) Rayleigh scatter;
(iii) Non selective scatter.

(9 marks)

(c) State the sensors on board of the following satellites:

(i) No AA;
(ii) Landsat 1, 2, 3;
(iii) Landsat 4, 5;
(iv) Landsat 7.

(4 marks)

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