



UNIVERSITY of
RWANDA

COLLEGE OF SCIENCE AND TECHNOLOGY
SCHOOL OF ENGINEERING
DEPARTMENT OF
CIVIL, ENVIRONMENTAL AND GEOMATIC ENGINEERING

END OF SEMESTER II EXAMINATION -ACADEMIC YEAR 2024-2025

YEAR: 2 & 3

SEMESTER: II

PROGRAMME: (SGE)

MODULE: SGE2264 and SGE3262 PHOTOGRAMMETRY II

DATE: 05 /06/2025

TIME: 2hours

MAXIMUM MARKS = 50

INSTRUCTIONS

1. This paper contains **FOUR (4)** questions.
2. **Answer THREE (3) Questions only:**
Question ONE (1) from Section "A" is Compulsory and Answer any TWO (2) from Section "B"
3. Any written materials and Programmable calculators are NOT allowed.
4. Do not forget to write your Registration Number.
5. Write all your answers in the booklet provided
6. Do not write any answers on this question paper.
7. **Start each question on a NEW page**

SECTION: A

Question: 1

[20]

- a) Rwanda Environmental Management Authority (REMA) would like to conduct a project to acquire LIDAR Topographic data and visible/near infrared images for the volcanoes community resilience, those data will be used as input to develop different products. As surveyor and geomatic engineer of this project:
- Explain why establishing photo control points is a crucial step for this project [1]
 - Give examples of objects that can be selected as horizontal and vertical control points for photogrammetric operations [2]
 - Describe the raw data that can be derived from LIDAR surveying [1]
 - Name the 3 products that could be generated from these data. [3]
- b) A typical aerial survey consists of photos at a scale of 1:4800, the desired output resolution for the orthophoto is approximately 30cm. For a 22.86cm aerial photograph, what is the scanning resolution in dot per inch? [3]
- c) Discuss the differences between laser scanning and photography and explain the benefits of collecting both at the same time [4]
- d) Camera calibration is very important step in close-range photogrammetry, discuss the methods of camera calibration, why do you think this step is very important in photogrammetry? [4]
- e) What do you understand by digital photogrammetric workstations (DPW)? [2]

SECTION: B

Question: 2

- a) Aerial photography is to be taken from a flying height of 6000 ft (1828.8m) above average ground with a camera having a 6-in (152.4mm) focal length and a 9in (23cm) format. End lap will be 60 percent, and side lap will be 30 percent. What is the ground area in acres covered by a single photograph and by the stereoscopic neat model? [3]
- b) Write short notes on the following terms used in Photogrammetry II [5]
- Tie points
 - Bundle Adjustment
 - Image Matching
 - Digital orthophoto image
 - Bridging
- c) Briefly explain the source of errors in orthophoto generation [4]
- d) Discuss the differences between laser scanning and photography and explain the benefits of collecting both at the same time. [3]

16 = 0.394 in

Question: 3**[15]**

- a) Discuss the advantages of aerial triangulation over ground surveying methods. **[2]**
- b) A laser mounted on an airplane emits a pulse that reflects off a target and returns to the sensor in 0.0062003 millisecond. Assume that the pulse is aimed directly down to the datum surface, that the speed of light in air is 299,703,000m/s, and that the laser is at exactly 1.2 km above the datum.
What is the object's height above datum? **[4]**
- c) Differentiate airborne laser scanning to terrestrial laser scanning and list the types of terrestrial laser scanners existing on the current market? **[4]**
- d) Image matching techniques are broadly categorized into two approaches. Explain these two categories in detail, and for each, describe the main techniques used **[5]**

Question: 4**[15]**

- a) Suppose that the project area is 18 km in the north-south direction and 26 km in the east-west direction and is to be photographed at a scale of 1:12000, End lap and side lap are 6 and 30 percent, respectively, the average velocity of the aircraft is 300 km/h and the camera format is 23 cm square. Align the first and last flight lines with 0.3S (side lap dimension) coverage outside the north and south project boundary lines
 - i. Prepare a flight map on a 1:24000 base map **[3]**
 - ii. Compute the total number of photographs needed to cover the area **[5]**
 - iii. Compute the total time of photography **[1]**
- b) Describe the three categories of aero-triangulation. Which category is the most accurate? Justify your answer **[3]**
- c) Discuss some of the uses of terrestrial or close-range photogrammetry **[3]**