MACHAKOS UNIVERSITY

University Examinations for 2019/2020Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 311: SURVEYING 1V

DATE: 2/12/2020 **TIME: 8.30-10.30 AM**

INSTRUCTIONS

- *This paper comprises of five questions. Answer **three** questions*
- *Question one is **compulsory** and carries 30 marks*
- *Use well labeled and neat diagrams where applicable.*
- *Answer any other **two** questions*

QUESTION ONE (30 MARKS)

a) What do you understand by the terms underground surveying define and explain the role? (2 marks)

b) What is correlation in respect to underground surveying? (2 marks)

c) State 3 applications of underground surveys as applied in road tunneling where excavations exceed 20m and are uneconomical. (3 marks)

d) How does underground surveying differ from surface surveys? (6 marks)

e) What is hydrographic surveying? In summary outline three tasks of Hydrographic Surveying? (2 marks)

f) Define photogrammetry and explain the 4 categories of photogrammetry (5 marks)

g) Using a well labeled sketch show that the scale of a horizontal photograph is given by Scale of a horizontal photograph=f/d where; (6 marks)

- f - is the ground distance
- d - is the plate distance

h) A tower of height 120M has an image of height 3.2cm in a photograph. Calculate the distance between the tower and the camera if f=152.4mm (4 marks)

QUESTION TWO (20 MARKS)

a) Differentiate between the following terms; (4 marks)

i. a vertical photograph and an oblique photograph

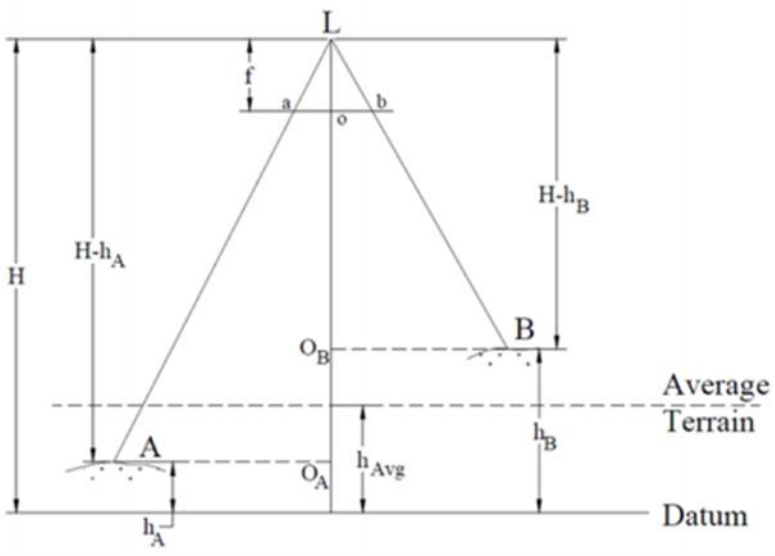
ii. Convergent photographs and trimetrogen photographs

b) With help of sketches differentiate between crab and drift in aerial photogrammetry (4 marks)

c) A vertical photograph was taken from a height of 1600m above MSL. Determine the scale of the photograph for an area at an average elevation of 250 m above MSL. The focal length of the camera (f) is 15 cm. (3 marks)

d) A camera of focal length 20 cm is used for a vertical photograph. The average elevation of the terrain is 1800m.At what height should the aircraft fly so that a scale of 1/10000 can be obtained from the photograph. (3 marks)

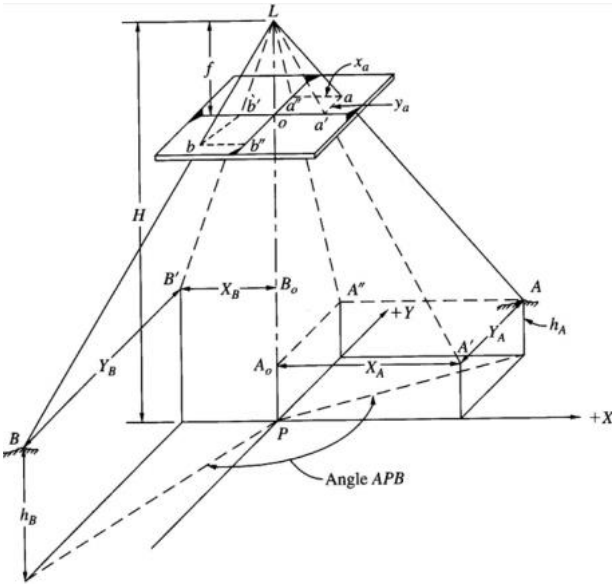
e) Using the diagram below suppose that highest terrain h_B, average terrain h_{avg}, and lowest terrain h_A of the figure below are 610, 460, and 310 m above mean sea level, respectively. Calculate maximum scale, minimum scale and average scale if flying height above mean sea level is 3000 m and camera focal length is 152.4 mm. (6 marks)



QUESTION THREE (20 MARKS)

a) Using the diagram below to show that; (10 marks)

$$AB = \sqrt{(X_B - X_A)^2 + (Y_B - Y_A)^2}$$



b) A vertical photo was taken with a 152.4 mm focal length camera at a flying height of 1385 m above the datum. The following were the results;

Point	x	y	Elevation
a	-52.35 mm	-48.27 mm	204 m
b	40.64 mm	43.88 mm	148 m

From the ground coordinates of the points a and b, determine the horizontal length/distance of AB. (10 marks)

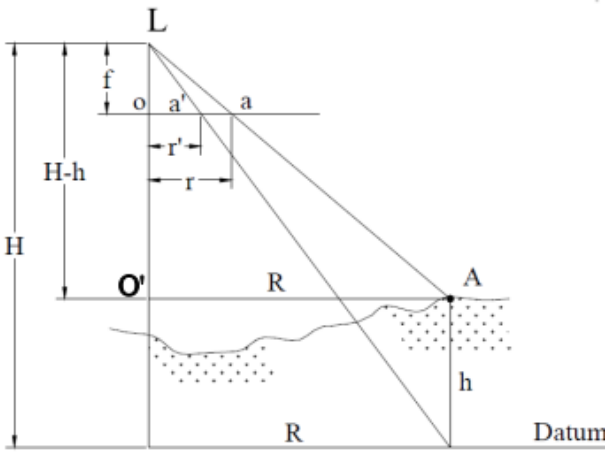
QUESTION FOUR (20 MARKS)

a) Define relief displacement (1 mark)

b) Briefly discuss the Sextant and with the help of a sketch describe its basic principle. (3 marks)

c) With the aid of the diagram below show that;

Relief displacement d= hr/H (6 marks)



d) A section line AB 300 m long on a flat terrain measures 102.4 mm on the vertical photograph. A radio tower also appears on the photograph. The distance measured from the principal points to the image at the bottom and top of the radio tower was found to be 7 cm and 8 cm respectively. The average elevation of then terrain was 553 m determine the height of the tower. Take f=152.4mm (5 marks)

e) A tall tower was photographed from an elevation of 700 m above datum. The radial distances of the top and bottom of the tower from the principal points are 112.50 mm and 82.40 mm respectively. If the bottom of the tower is at an elevation 250 m above the datum, then what the height (expressed in m) of the tower. (5 marks)

QUESTION FIVE (20 MARKS)

a) Define stereoscopy (1 mark)

b) State three objectives of flight planning? (3 marks)

c) Vertical photographs of size 30 cm by 20 cm were taken to cover a total ground area of 32000 KM^2 if the scale of the photographs is 1cm=400m then calculate the number of photographs required if the longitudinal lap is 40% and the side lap is 30%. (4 marks)

d) The following data was obtained from an aerial photography flight plan

1. Area – 15 miles N-S & 8.5 miles E-W
2. Photos – 9” x 9”
3. Scale to be 1:12000 @ 700’ above elevation
4. overlap – 60%
5. Side lap – 35%
6. Ground speed of plane – 150 mph

7. Flight lines to be laid out N-S on a map @ a scale of 1:62500
8. Outer flight lines coincide with E & W boundary

Calculate:

i. Flying Height
ii. Ground Distance Between Flight lines
iii. Number of flight lines
iv. Adjusted ground distance between flight lines
v. Spacing of flight lines on flight map
vi. Ground Distance Between Exposures with 60% overlap gain on each photo

(12 marks)