



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE

IN CIVIL ENGINEERING

ECV 311: SURVEYING IV

DATE: 16/6/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper comprises of **five** questions
- Question **one** is **compulsory** and carry 30 marks
- Answer any **other two** questions

QUESTION ONE (30 MARKS)

- a) Define the following terminologies as used in photogrammetry (10 marks)
- Aerial photogrammetry
 - X-parallax
 - Stereoscopy
 - Restitution
 - Forward compensation mechanism
- b) Explain how the optical method is used to connect and orient the underground control networks into the same coordinate system as the surface networks. (5 marks)
- c) Calculate the flying height and altitude, given a photographic scale of 1:20,000, a lens focal length of 153 mm and an elevation of mean datum of 180m. (3 marks)
- d) List four applications of hydrographic surveying (2 marks)

- e) Calculate the approximate number of photographs required for stereographic coverage (60% forward overlap & 25% side overlap). Consider a photographic scale of 1:30,000, ground area coverage of 30 km by 45 km & a photographic standard format size of 230 mm × 230 mm (5 marks)
- f) Outline the camera constants obtained from the calibration process (3 marks)
- g) What is the basic difference between x-parallax and y-parallax associated with conjugate points in a stereo-pair? (2 marks)

QUESTION TWO (20 MARKS)

- a) What is the objective of photogrammetric orientation? (2 marks)
- b) Given that the distance between point A and B on a topographic map is 4.75cm, at a scale of 1:50,000, and the distance between the same points on an air photograph is 23.07 cm, calculate the photographic scale (3 marks)
- c) Describe the various steps in photogrammetric orientation (15 marks)

QUESTION THREE (20 MARKS)

- a) Explain how the weisbach triangle method is used to connect and orient the underground control networks into the same coordinate system as the surface networks. (10 marks)
- b) From Figure 1 below, the national grid (NG) bearing of an underground base line, CD , is established by co-planning at the surface onto two wires, W_1 and W_2 , hanging in a vertical shaft, and then using a Weisbach triangle underground. The measured field data is as follows:

NG bearing AB : $74^\circ 28' 34''$, NG coordinates of A : E 304 625 m, N 511 612 m, the horizontal angles: BAW_s $284^\circ 32' 12''$, AW_sW_2 $102^\circ 16' 18''$, $W_2W_uW_1$ $0^\circ 03' 54''$, W_1W_uC $187^\circ 51' 50''$, W_uCD $291^\circ 27' 48''$ and the horizontal distances: W_1W_2 3.625 m, W_uW_2 2.014 m. Compute the bearing of the underground base. (10 marks)

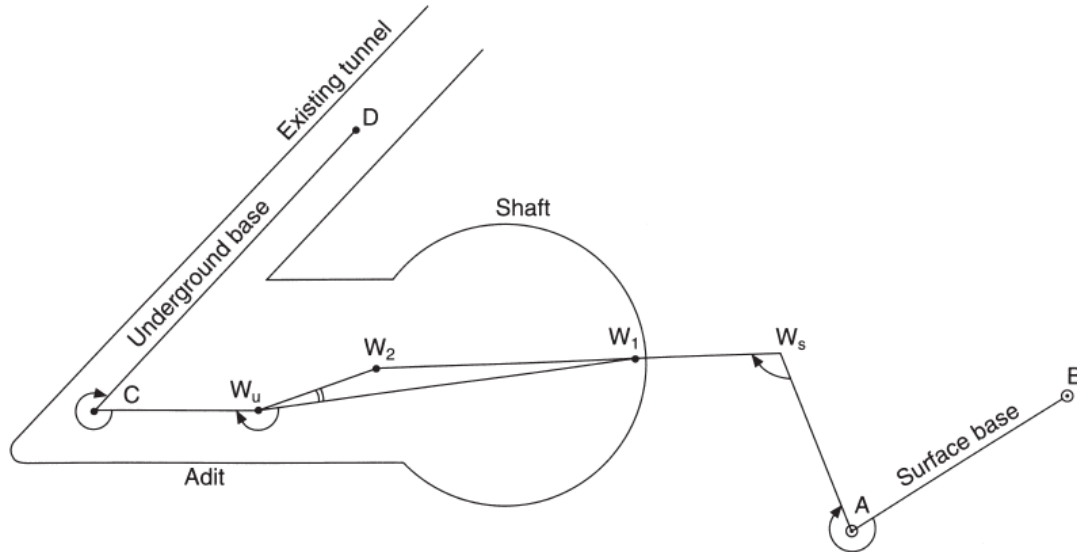


Figure 1

QUESTION FOUR (20 MARKS)

- a) In the Figure 2, for a certain photograph, $H = 1200\text{m}$, $f = 152\text{mm}$, vc is measured as 88.36 mm and vb as 90.78 mm :

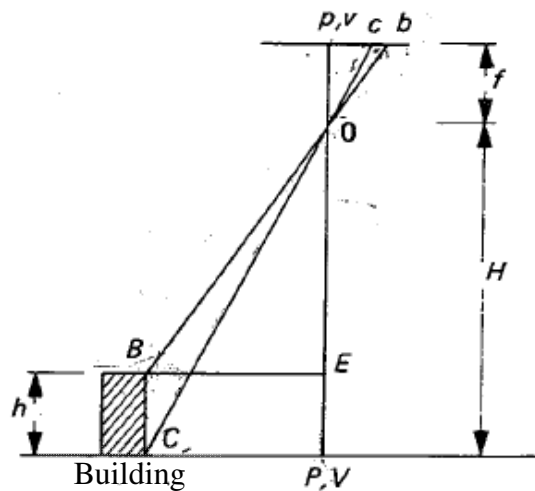


Figure 2

- Derive an equation for the displacement bc
 - Estimate the height of a building (5 marks)
- b) Explain three applications of photogrammetry in Civil Engineering (15 marks)

QUESTION FIVE (20 MARKS)

- a) Outline the two basic tasks involved in hydrographic surveys. (1 mark)
- b) With the aid of a well labelled diagram, define the most commonly used terms in a near vertical photograph with the optical axis tilted at θ to the vertical. (9 marks)
- c) Describe procedures for mapping water bodies. (10 marks)