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UNIVERSITI SAINS MALAYSIA

KSCP Examination  
Academic Session 2008/2009

June 2009

**EAK 261/3 – Geomatic Engineering**  
*[Kejuruteraan Geomatik]*

Duration : 3 hours  
*[Masa : 3 jam]*

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Please check that this examination paper consists of **NINE (9)** printed pages before you begin the examination.

*[Sila pastikan kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat bercetak sebelum anda memulakan peperiksaan ini.]*

**Instructions:** Answer **ALL (5)** questions. All questions carry the same marks.

*[Arahan: Jawab **SEMUA (5)** soalan. Semua soalan membawa jumlah markah yang sama.]*

You may answer the question either in Bahasa Malaysia or English.

*[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]*

All questions **MUST BE** answered on a new page.

*[Semua soalan **MESTILAH** dijawab pada muka surat baru.]*

Write the answered question numbers on the cover sheet of the answer script.

*[Tuliskan nombor soalan yang dijawab di luar kulit buku jawapan anda.]*

1. You recently conducted your Annual Intensive Geomatic Practical at Cinta Alam Kelimat Eco Village in Sungai Siput from the 5<sup>th</sup> till 9<sup>th</sup> of May 2009. In the process of establishing the horizontal and vertical controls before the actual survey work was carried out, 2 tests namely the Two Peg Test and the Differential Field Test were carried out.

(a) Explain the purpose of carrying out the Two Peg Test and state **THREE (3)** common reasons why the test is normally carried out.

(5 marks)

(b) Explain why and how the Differential Field Test was carried out in the field.

(5 marks)

(c) A Two Peg Test was carried out and the following readings were recorded:

BS	IS	FS	Rise	Fall	Remarks
First set-up					
1.075					Staff at A; AB = 60 m
		1.247			Staff at B; instr. midway at C
Second set-up					
1.783					Staff at A
		1.946			Staff at B; instr. at D, 0.5m right of A on line AB

[i] Determine the collimation error of the instrument.

(8 marks)

[iii] If the level had been in perfect adjustment, what reading would have been observed at B from the second instrument set-up?

(2 marks)

2. A traverse was carried out and the results of the survey are as shown as Figure 1.

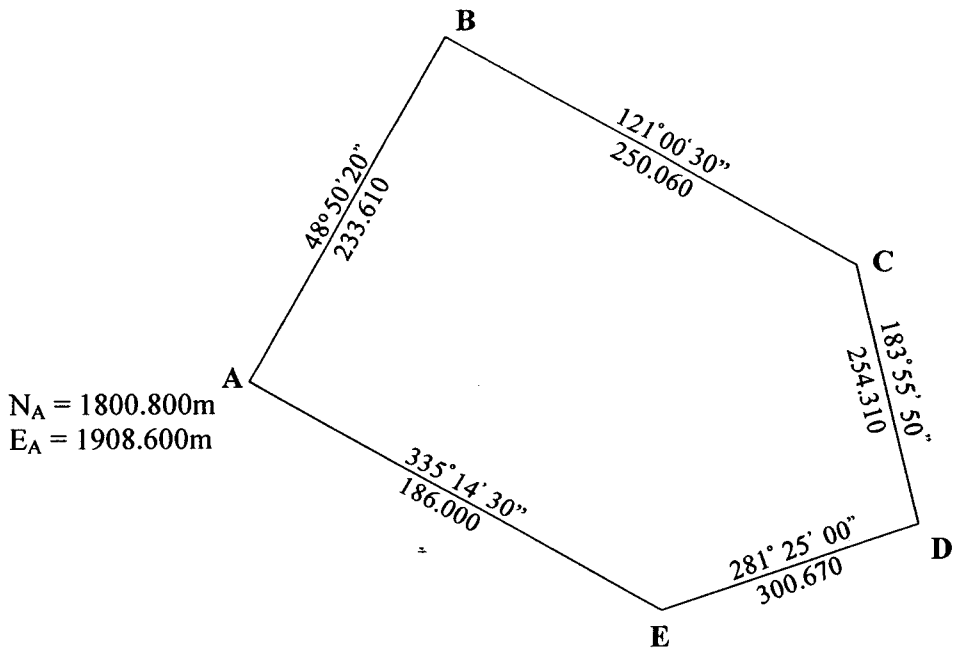


Figure 1

(a) Find the adjusted coordinates of stations B, C, D and E using the Bowditch method of adjustment and determine the linear misclosure of the traverse.

(14 marks)

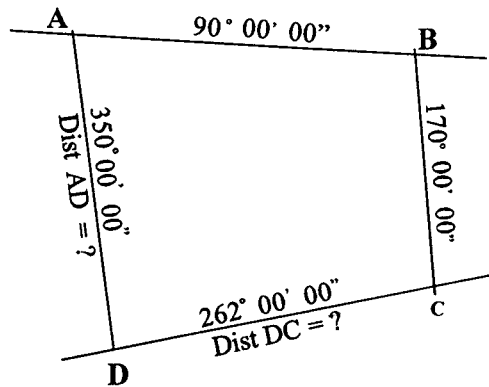


Figure 2

(b) Figure 2 shows a piece of land with some information missing. If the coordinates of A and C are (0.000mN, 0.000mE) and (-59.088mN, 30.419mE) respectively, find the distances of CD and AD.

(6 marks)

...4/-

3. (a) What is survey reconnaissance and state **FOUR (4)** reasons why it is one of the most important aspects of any kind of survey?

(5 marks)

- (b) A steel band of nominal length 30m was used to measure a line XY by suspending it between supports at both ends and the following information was recorded:

Measured length	:	29.874m
Slope angle	:	03° 30' 30"
Mean temperature	:	28°C
Tension applied	:	110 N

Young's modulus (E) for the tape material is  $200 \text{ kNmm}^{-1}$  and the coefficient of thermal expansion ( $\alpha$ ) is 0.000 0112 per °C. The standardized length of the tape against a reference tape was known to be 30.016 m at 20°C and 50N tension. If the tape weighs  $0.17 \text{ Nm}^{-1}$  and has a cross-sectional area of  $2 \text{ mm}^2$ , calculate the horizontal length of XY.

(15 marks)

4. (a) In stadia tacheometry, a staff is held vertically at A at one end of the line being measured and a theodolite is set up above the other at B. Sketch suitable diagrams to show how the horizontal distance AB, vertical distance and the reduced level of point B are deduced when point A is higher AND lower than point B.

(5 marks)

- (b) The accuracy of stadia tacheometry depends on both the instrumental errors and the field errors. State **TWO (2)** possible sources of field errors and how the effects could be minimized.

(5 marks)

- (c) "Often court proceedings involve surveys made long after. In some cases, it is quite likely that old field notes will be the only visible evidence, and its value will depend largely upon the clarity and completeness with which they are recorded."

From the above statement, explain the importance of proper field booking that constitutes a permanent survey record for engineers and explain how this is achieved.

(5 marks)

- (d) The choice of a proper contour interval for a topographic survey and map is based upon four principle considerations. Briefly explain any **THREE (3)** of these considerations.

(5 marks)

5. (a) A piece of land having an irregular boundary of 960m in length has been designated as a new landfill site. The boundary has been marked off into **EIGHT (8)** equal intervals and is recorded as follows:

50m, 130m, 150m, 180m, 200m, 240m, 120m, 60m and 50m

Find the area of the landfill in hectares using the Simpson's rule.

(10 marks)

- (b) Calculate the side width and the cross-sectional area of an embankment having a two level section as shown in Figure 3.

Calculate the volume of the earthwork excavation if the cross section used to calculate the earthwork of a proposed road 100 m in length is assumed to be constant.

(10 marks)

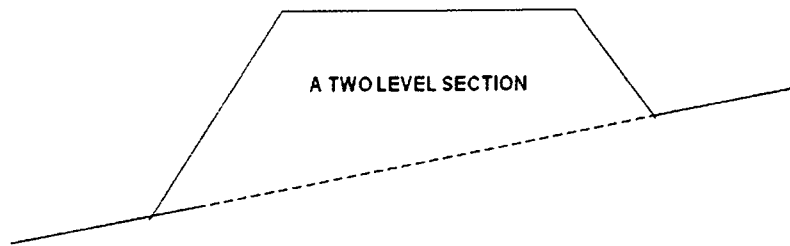


Figure 3

Road formation width	= 20 m
Existing ground slope	= 1 in 10
Side slope	= 1 in 2
Centre height	= 10 m

1. Anda telah menjalani Khemah Kerja Ukur Tahunan di Cinta Alam Kelimat Eco Village di Sungai Siput pada 5hb. hingga 9hb. Mei 2009. Sebelum menjalankan kerja-kerja ukur sebenar, kawalan-kawalan ufuk dan pugak perlu ditubuhkan dan 2 ujian iaitu Ujian Dua Piket dan Ujian Pembezaan Lapangan telah dijalankan.

(a) Nyatakan tujuan Ujian Dua Piket dijalankan dan nyatakan **TIGA (3)** sebab lazim kenapa Ujian Dua Piket dijalankan.

(5 markah)

(b) Terangkan kenapa dan bagaimana Ujian Pembezaan Lapangan dijalankan di lapangan.

(5 markah)

(c) Satu Ujian Dua Piket telah dijalankan dan cerapan berikut telah dicatat:

PB	PA	PH	Naik	Turun	Catatan
<i>Kedudukan pertama</i>					
1.075					Staf di A; AB = 60 m
		1.247			Staf di B; alat di tengah-tengah di C
<i>Kedudukan kedua</i>					
1.783					Staf di A
		1.946			Staf di B; alat di D, 0.5m di sebelah kanan A di atas garisan AB

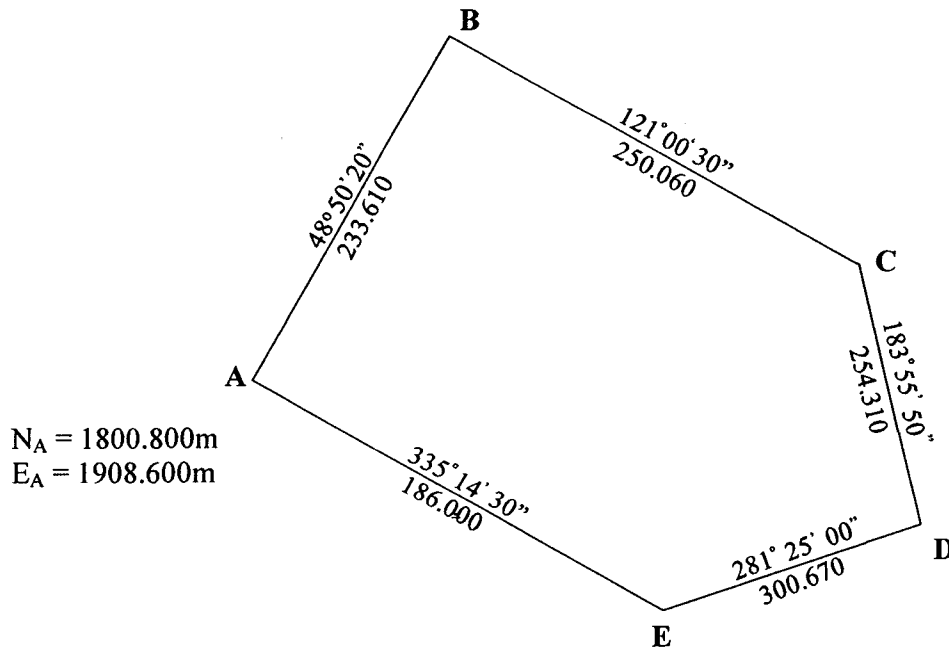
[i] Tentukan selisih kolimatan bagi alat tersebut.

(8 markah)

[iii] Jika alat aras berada dalam pelarasan yang baik, apakah bacaan yang akan dibaca pada staf di B dari kedudukan alat yang kedua?

(2 markah)

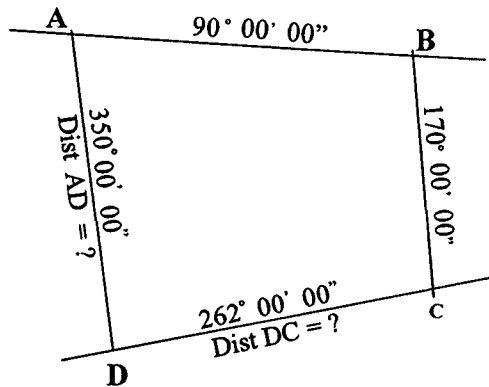
2. Satu ukuran travers telah dijalankan dan keputusan pengukuran adalah seperti yang ditunjukkan dalam Rajah 1.



Rajah 1

(a) Dengan menggunakan kaedah pelarasan Bowditch, kira koordinat terlaras bagi stesen B, C, D dan E dan tentukan tikaian lurus travers tersebut.

(14 markah)



Rajah 2

(b) Rajah 2 menunjukkan sekeping tanah di mana beberapa maklumat didapati hilang. Jika koordinat bagi A dan C masing-masing adalah  $(0.000\text{mU}, 0.000\text{mT})$  dan  $(-59.088\text{mU}, 30.419\text{mT})$ , kira jarak CD dan AD.

(6 markah)

3. (a) Apakah ukur tinjauan dan nyatakan **EMPAT (4)** sebab kenapa ianya merupakan salah satu aspek terpenting dalam mana-mana kerja pengukuran?  
(5 markah)

- (b) Satu pita keluli panjang namaan 30m telah digunakan untuk mengukur jarak garisan XY dengan menumpang di kedua-dua penghujungnya dan maklumat berikut telah dicatat:

Jarak diukur	:	29.874m
Sudut cerun	:	03° 30' 30"
Suhu min	:	28°C
Tegangan dikenakan)	:	110 N

Modulus Young ( $E$ ) bagi bahan pita ialah  $200 \text{ kNmm}^{-1}$  dan angkali pengembangan terma ( $\alpha$ ) ialah 0.000 0112 per °C. Panjang berpiawai pita berbanding dengan pita rujukan ialah 30.016 m pada suhu 20°C dan tegangan 50N. Jika berat pita ialah  $0.17 \text{ Nm}^{-1}$  dan luas keratan rentasnya ialah  $2 \text{ mm}^2$ , kira jarak ufuk XY.

(15 markah)

4. (a) Dalam tekemetri stadia, staf berdiri tegak di A di satu hujung garisan yang diukur dan tiodolit didirikan di hujung garisan di B. Lakarkan gambar rajah yang sesuai bagi menunjukkan bagaimana jarak ufuk AB, jarak pugak dan aras laras titik B diperolehi apabila titik A lebih tinggi DAN rendah dari titik B.

(5 markah)

- (b) Kejituan tekimetri stadia bergantung kepada ralat-ralat alatan dan lapangan. Nyatakan **DUA (2)** sumber ralat lapangan dan bagaimana kesannya boleh dikurangkan.

(5 markah)

- (c) "Perbicaraan di mahkamah sering melibatkan kerja-kerja pengukuran yang dijalankan terdahulu. Dalam kes-kes tertentu, catatan buku kerja lapangan mungkin merupakan satu-satunya bukti yang nyata dan nilainya banyak bergantung kepada sejauh mana jelas dan lengkapnya catatan tersebut."

Dari kenyataan di atas, terangkan kepentingan pembukuan buku kerja lapangan yang merupakan rekod kekal kerja-kerja pengukuran bagi jurutera dan terangkan bagaimana ianya dicapai.

(5 markah)

- (d) Pemilihan sela kontur yang sesuai bagi peta dan ukur topografi adalah berdasarkan kepada empat prinsip utama. Terangkan secara kasar mana-mana **TIGA (3)** prinsip tersebut.

(5 markah)

5. (a) *Sekeping tanah yang mempunyai sempadan tidak sekata sepanjang 960m telah dikenalpasti sebagai tapak pelupusan baru. Sempadan tersebut telah dibahagi kepada lapan (8) bahagian sama rata seperti catatan berikut:*

*50m, 130m, 150m, 180m, 200m, 240m, 120m, 60m dan 50m*

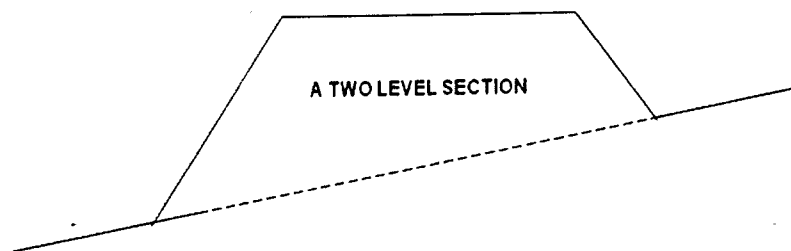
*Kira keluasan tapak pelupusan tersebut dalam hektar dengan menggunakan rumusan Simpson.*

*(10 markah)*

- (b) *Kira lebar formasi sisi dan luas muka keratan sebuah tambakan jenis seksyen dua aras yang ditunjukkan dalam Rajah 3.*

*Kira jumlah isipadu kerja tanah tambakan jika keratan rentas tersebut yang digunakan untuk mengira hasil kerja tanah bagi cadangan pembinaan jalan raya sepanjang 100 m dianggap malar.*

*(10 markah)*



**Rajah 3**

*Lebar aras bentukan = 20 m*  
*Cerun permukaan sedia ada = 1 dalam 10*  
*Cerun sisi tambakan = 1 dalam 2*  
*Tinggi permukaan tengah = 10 m*