UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2005/2006 Academic Session
Peperiksaan Semester Pertama
Sidang Akademik 2005/2006

November 2005

EAK 261E/3 – Geomatics Engineering

EAK 261E/3 - Kejuruteraan Geomatik

Duration: 3 hours
Masa: 3 jam

Instructions to candidates:
Arahan kepada calon:

1. Ensure that this paper contains **NINE (9)** printed pages before you start your examination.
   *Sila pastikan kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat bercetak sebelum anda memulakan peperiksaan ini.*

2. This paper contains **SIX (6)** questions. Answer all questions from Part A – Compulsory Question and any **FOUR (4)** from Part B.
   *Kertas ini mengandungi ENAM (6) soalan. Jawab semua soalan dari Bahagian A **Soalan Wajib** dan mana-mana EMPAT (4) dari Bahagian B.*

3. All questions **CAN BE** answered in English or Bahasa Malaysia or a combination of both languages.
   *Semua soalan **BOLEH** dijawab dalam Bahasa Inggeris atau Bahasa Malaysia atau kombinasi kedua-dua bahasa.*

4. All questions **MUST BE** answered on a new sheet.
   *Semua jawapan **MESTILAH** dijawab di muka surat baru.*

5. Write the answered question numbers on the cover sheet of the answer script.
   Tuliskan nombor soalan yang dijawab di luar kulit buku jawapan anda.

PART A - Compulsory Question
(BAHAGIAN A – Jawab Semua Soalan)

1. (a) What is reciprocal Levelling? With the help of a neat sketch, derive the formula for true difference of elevation and the error for it.

(7 marks)

Apakah yang dimaksudkan dengan pengarasan salingan? Dengan bantuan lakaran yang sesuai, terbitkan persamaan untuk perbezaan ketinggian sebenar dan selisihnya.

(7 markah)

(b) The final bearings and lengths of the sides of a closed traverse are given in the following table:

Bering akhir dan panjang sisi sebuah travers tertutup adalah seperti di dalam jadual:

Point [*Titik*]	Line [*Garis*]	Bearing [*Bering*]	Length [*Panjang*]
A			
	AB	$51^0\ 22'\ 00''$	200.79
B			
	BC	$82^0\ 08'\ 50''$	191.18
C			
	CD	$181^0\ 10'\ 10''$	184.24
D			
	DE	$244^0\ 51'\ 00''$	289.52
E			
	EA	$332^0\ 46'\ 10''$	175.12

Calculate:
(i) the corrected latitudes and departures;
(ii) the accuracy of the traverse; and
(iii) the coordinates of all the points if the coordinates of point D are (800 N, 1000 E).

(17 marks)

Kira:
(i) pembetulan latit dan dipat;
(ii) ketepatan travers; dan
(iii) koordinat bagi setiap stesen jika kordinat stesen D ialah (800U, 1000T).

(17 markah)

Show all the formulae and the necessary calculations. (Use the attached computation form to show your calculations and results).

Tunjukkan semua persamaan dan pengiraan yang diperlukan. (Gunakan borang pengiraan yang dilampirkan untuk pengiraan dan jawapan anda).

1. (c) You are going to take the observations with a theodolite to measure the horizontal angles. Explain the temporary adjustments you will perform before taking the observations.

(6 markah)

Anda akan membuat cerapan menggunakan sebuah teodolit untuk mengukur sudut-sudut ufuk. Terangkan kaedah-kaedah pelarasan sementara yang anda akan lakukan sebelum cerapan-cerapan dibuat.

(6 marks)

(d) A fixed hair tacheometer fitted with anallatic lens and having its constant 100, was set up at station C and the following observations were made:

Sebuah alat takeometer bebenang tetap yang dilengkapi dengan kanta analitik dan mempunyai angkali darab 100 telah didirisiapkan di stesen C dan cerapan-cerapan berikut telah diperolehi:

Station Sighted [Cerapan ke stesen]	Bearing [Bearing]	Stadia readings [Bacaan-bacaan Stadia]	Vertical angle [Sudut Pugak]
A	$50^0\ 40'\ 20''$	2.585, 1.750, 0.915	$+06^0\ 36'\ 30''$
B	$310^0\ 43'\ 40''$	3.655, 2.210, 0.765	$-\ 09^0\ 24'\ 50''$

Calculate the horizontal distance between the points A and B, and the elevation of point B if the elevation of point A is 20.865m.

(10 marks)

Kira jarak ufuk di antara titik-titik A dan B, dan ketinggian titik B jika ketinggian titik A ialah 20.865m.

(10 markah)

PART B - Answer any Four (4) questions only
*Bahagian B – Jawab Mana-mana **EMPAT (4)** soalan sahaja*

2. (a) State the sources which can cause errors in leveling observations.

(5 marks)

Nyatakan sumber-sumber yang boleh menyebabkan selisih dalam cerapan-cerapan ukur aras.

(5 markah)

(b) While carrying out the permanent adjustment of a level using the Two Peg-Test method, the following observations were made:

Instrument at C, midway between points A and B, 30 m apart
Reading at point A = 2.310 m
Reading at point B = 2.721 m

Instrument at peg D in line of AB such that AD = 35 m and BD = 5 m
Reading at point A = 1.134 m
Reading at point B = 1.782 m

Check whether the instrument needs permanent adjustment or not and state the inclination of the line of sight. What should be the correct readings at A and B if the instrument is to be adjusted?

(10 markah)

Semasa menjalankan pelarasan tetap sebuah alat aras menggunakan kaedah Ujian Dua Piket, cerapan-cerapan berikut telah diambil:

Alat di C di tengah-tengah antara titik A dan B, jarak 30 m
Bacaan di titik A = 2.310 m
Bacaan di titik B = 2.721 m

Alat di D dalam garisan AB di mana AD = 35m dan BD = 5m
Bacaan di titik A = 1.134 m
Bacaan di titik B = 1.782 m

Semak samada alat tersebut memerlukan pelarasan tetap atau tidak dan tentukan kecondongan garis pandangan. Berapakah bacaan sebenar di A dan B jika alat dilaraskan?

(10 markah)

3. (a) What is contour? Describe the important characteristics of contour lines with suitable diagrams.

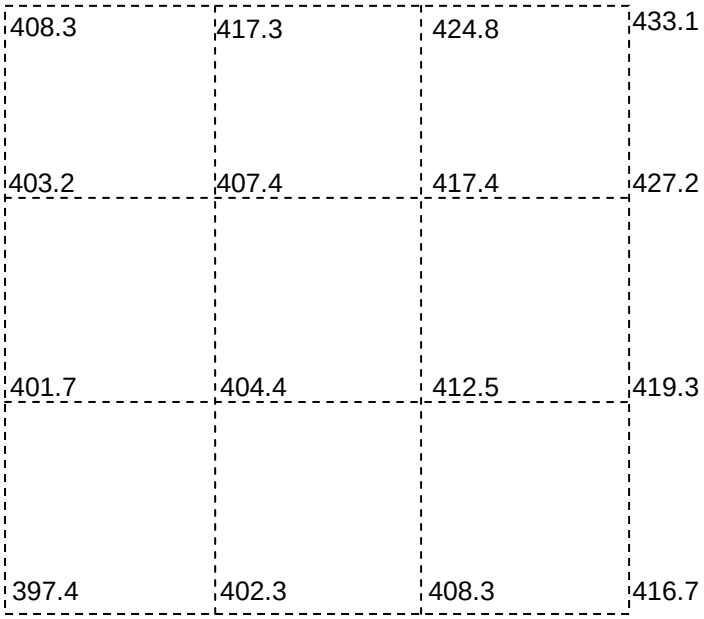
(8 marks)

Apa itu kontor? Dengan bantuan rajah yang sesuai, terangkan cici-ciri penting bagi garis kontor.

(8 markah)

3. (b) An area was divided into small squares each of size 10 x 10 m and the levels of the corners of the squares were computed as shown below:

Satu kawasan telah dibahagikan kepada segiempat sama 10 x 10 m dan aras di setiap penjuru segiempat ditunjuk seperti berikut:



Draw a neat sketch of the area on your answer script and plot the contours of 400, 410, 420 and 430 m.

(7 marks)

Lakarkan kawasan tersebut di atas kertas jawapan anda dan plot kontor-kontor bagi 400m, 410m, 420m dan 430m.

(7 markah)

4. (a) Differentiate between systematic and random errors. Describe the important features of accidental errors.

(5 marks)

Jelaskan perbezaan di antara ralat sistematik dan ralat rawak. Huraikan ciri-ciri penting ralat sasulan.

(5 markah)

4. (b) In a traverse survey the following eight measurements of one of the angles were made using a theodolite:

Dalam sebuah kerja ukur travers, lapan cerapan bagi sebuah sudut telah dijalankan menggunakan sebuah tiodolit.

Serial No. [*Bil. Cerapan*]	Horizontal Angle [*Sudut Ufuk*]
1.	$67^0\ 42'\ 10''$
2.	$67^0\ 41'\ 50''$
3.	$67^0\ 41'\ 40''$
4.	$67^0\ 42'\ 00''$
5.	$67^0\ 41'\ 50''$
6.	$67^0\ 42'\ 00''$
7.	$67^0\ 42'\ 10''$
8.	$67^0\ 42'\ 20''$

Determine:
(a) the standard error;
(b) the standard error of the mean;
(c) the most probable error; and
(d) the most probable error of the mean.

(10 marks)

Dapatkan:
(a) ralat piawai;
(b) ralat piawai min;
(c) ralat paling barangkali; dan
(d) ralat paling barangkali min.

(10 marks)

5. (a) What is tacheometry? Derive the formulae for horizontal distance and vertical elevation in stadia tacheometry when the line of sight is inclined.

(7 marks)

Apakah takimetri? Hasilkan persamaan-persamaan bagi jarak ufuk dan aras pugak dalam takimetri stadia apabila garis pandangannya condong.

(7 marks)

5. (b) The following is the page of a level field book taken for establishing some points from A to K between two temporary bench marks TBM1 (RL = 42.280m) and TBM2 (RL = 42.809m) which are 2.6 kms apart.

Calculate the reduced level of all the points. Adjust the misclosure, if any. Assume the levelling to be of class II.

(8 marks)

Berikut adalah pembukuan kerja ukur aras yang dijalankan untuk menubuhkan beberapa titik dari titik A dan titik K yang terletak di antara dua batu aras sementara iaitu TBM1 (AL = 42.280m) dan TBM2 (AL = 42.809m). Jarak di antara kedua-dua TBM ialah 2.6km.

Kira aras laras kesemua titik. Laraskan selisih, jika ada. Anggapkan kerja ukur aras kelas II.

(8 markah)

Station [*Stesen*]	Back Sight [*Pandangan Belakang*]	Intermediate Sight [*Pandangan Antara*]	Fore Sight [*Pandangan Hadapan*]	Remarks [*Catatan*]
TBM1	2.632			TBM1 (42.280m)
A		1.528		
B		2.905		
C	1.550		0.938	
D		2.715		
E		2.105		
F		2.783		
G	1.905		1.584	
H		2.643		
I	1.654		2.028	
J		2.085		
K		1.534		
TBM2			2.650	TBM2 (42.809m)

6. (a) A plot of land ABCDA has four sides. Sides AB and BC are straight but sides CD and DA are irregular. The length of AB = 150m; BC = 165m, CD = 155m, DA = 162m, and AC = 230m. Offsets are taken along CD and DA to the irregular boundaries as shown below and the readings are tabulated as follows:

Plot tanah ABCDA mepunyai empat sisi. Sisi AB dan BC adalah lurus manakala sisi CD dan DA mempunyai garisan tidak sekata. Jarak sisi AB = 150m; BC = 165m, CD = 155m, DA = 162m, dan AC = 230m. Garis ofset telah diambil di sepanjang garis CD dan DA seperti di bawah dan bacaan ditunjukkan dalam jadual seperti berikut:

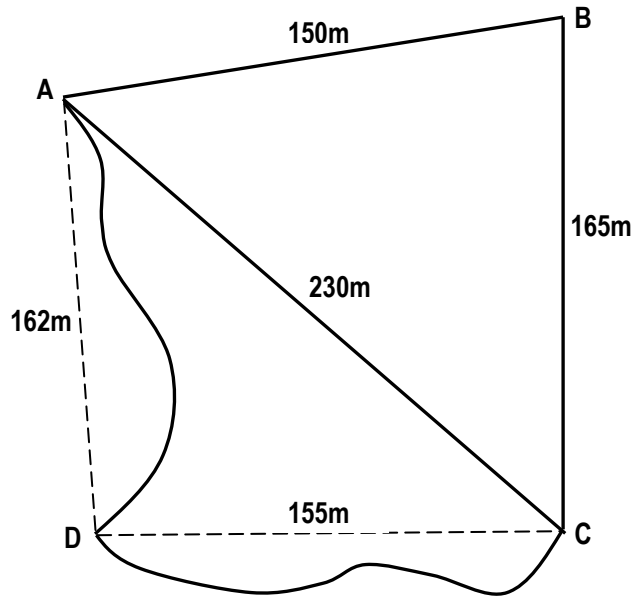
Offsets outwards along line CD [m] *Bacaan ofset keluar garis CD [m]*		Offsets inwards along line DA [m] *Bacaan ofset ke dalam garis CD [m]*	
0	0.00	0	0.00
30	1.50	30	1.62
60	2.00	60	2.45
90	2.25	90	2.30
120	1.75	120	1.22
155	0.00	162	0.00

Calculate the area of the plot ABCDA.

(8 marks)

Kira keluasan plot tanah ABCDA.

(8 markah)



6. (b) An embankment for a road quarry is to be built with formation width of 12m and side slopes of 1:2. The central height is 5m and the slope of the original ground surface at right angles to the centre line of embankment is 1 in 10.

Calculate the quantity of earth work in cubic meters if a 50m long road quarry is proposed.

(7 marks)

Satu tambakan untuk sebatang jalan kuari dengan lebar bentukan 12m dan kecerunan 1:2 akan dibina. Ketinggian tengah tambakan adalah 5m dan kecerunan sebenar permukaan tanah pada sudut tepat ke garisan tengah tambakan ialah 1 dalam 10.

Kira kuantiti isipadu tanah dalam meter kiub jika jalan kuari sepanjang 50m dicadangkan pembinaannya.

(7 markah)

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