
UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2004/2005 Academic Session
*Peperiksaan Semester Pertama
Sidang Akademik 2004/2005*

October 2004

EAK 261E/3 – Geomatic Engineering
EAK 261E/3 - Kejuruteraan Geomatik

Duration: 3 hours
Masa: 3 jam

Instructions to candidates:

Arahan kepada calon-calon:

1. Ensure that this paper contains **SIX (6)** printed pages before you start your examination.
Sila pastikan kertas peperiksaan ini mengandungi ENAM (6) muka surat bercetak sebelum anda memulakan peperiksaan ini.
2. This paper contains **SIX (6)** questions. Answer **FIVE (5)** questions only. Marks will be given to the **FIRST FIVE (5)** questions put in order on the answer script and **NOT** the **BEST FIVE (5)**.
*Kertas ini mengandungi ENAM (6) soalan. Jawab LIMA (5) soalan sahaja. Markah hanya akan dikira bagi LIMA (5) jawapan **PERTAMA** yang dimasukkan di dalam buku mengikut susunan dan bukannya LIMA (5) jawapan terbaik.*
3. All questions carry equal marks.
Semua soalan mempunyai markah sama.
4. 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.*
5. All questions **MUST BE** answered on a new sheet.
*Semua jawapan **MESTILAH** dimulakan pada muka surat baru.*
6. 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. (a) In running a closed traverse ABCDE, lines CD and DE could not be measured due to some obstacles. Determine the missing lengths of the lines CD and DE from the following data.

(10 marks)

Semasa menjalankan satu ukur terabas tertutup ABCDE, jarak garisan-garisan CD dan DE tidak dapat diukur kerana terdapat beberapa halangan. Berdasarkan data berikut, tentukan jarak bagi garisan CD dan DE.

(10 markah)

Point (Titik)	Line (Garisan)	Bearing	Length (Jarak)
A			
	AB	N 45°10' 20"E	89.31
B			
	BC	N 72° 05' 00"E	219.76
C			
	CD	S 18° 08' 20"E	?
D			
	DE	S 48° 43' 30"W	?
E			
	EA	N 59° 18' 40"W	232.26

- (b) What do you understand by traversing and why it is carried out? State the difference between a closed and an open traverse. If you were asked to plot the details of a part of the USM campus, explain the criteria which you will adopt for selecting the traverse stations.

(10 marks)

Apakah kefahaman anda tentang menerabas dan kenapa ianya dijalankan? Nyatakan perbezaan di antara terabas terbuka dengan terabas tertutup. Jika anda ditugaskan untuk menghasilkan plotan butiran bagi sebahagian kampus USM, terangkan kriteria yang anda akan gunakan dalam pemilihan stesen-stesen terabas tersebut.

(10 markah)

2. (a) In running fly levels from a bench mark (BM) of reduced level (RL) = 250.000 m, the following readings were obtained:

Back sights = 1.315, 2.035, 1.980, 2.625

Fore sights = 1.150, 3.450, 2.255

From the last position of the instrument, five pickets at 20 m intervals are to be set out on a uniform rising gradient of 1 in 40. The first picket is to have a RL of 247.245 m.

Work out the staff readings required for setting the top of the pickets on the given gradient.

(10 marks)

Semasa menjalankan kerja ukur aras layang dari batu aras (BA) dan nilai aras larasnya (AL) = 250.000 m, bacaan-bacaan berikut telah diperolehi:

Pandangan Belakang = 1.315, 2.035, 1.980, 2.625

Pandangan Hadapan = 1.150, 3.450, 2.255

Pada kedudukan terakhir alat, lima piket telah diset di atas cerun yang naik secara seragam 1 dalam 40 pada sela jarak 20 m. Aras laras piket pertama ialah 247.245 m.

Kira bacaan-bacaan staf di atas piket yang diperlukan untuk mengeset cerun tersebut.

(10 markah)

- (b) What is reciprocal leveling? Derive the formula for the true difference of elevation and the error for it.

(10 marks)

Apakah pengarasan salingan? Terbitkan persamaan bagi perbezaan ketinggian dan selisih baginya.

(10 markah)

- 3. (a) Determine the length of line AB and the elevations of points A and B from the following observations made with a tacheometer fitted with an anallatic lens. The constant of the instrument was 100 and the staff was held vertically. The reduced level (RL) of station P is 9.346 m.

Determine the gradient of line AB.

(10 marks)

Tentukan jarak bagi garisan AB dan ketinggian bagi titik-titik A dan B berdasarkan cerapan yang telah dibuat seperti berikut menggunakan takeometer yang dilengkapi dengan kanta analaktik. Pemalar alat ialah 100 dan staf telah didirikan secara pugak. Aras laras (AL) stesen P ialah 9.346 m.

Tentukan kecerunan garisan AB.

(10 markah)

Instn. Sin (Sin alat)	Staf Sin (Staf staf)	Bearing	Vertical angle (Sudut pugak)	Staff readings (Bacaan staf)
A	A	134° 46' 20"	+9° 36' 30"	1.362, 1.917, 2.472
	B	226° 52' 10"	+4° 49' 40"	1.066, 1.886, 2.706

- (b) Explain how you would determine the constants of a tacheometer in the field.

(5 marks)

Terangkan bagaimana anda tentukan pemalar-pemalar bagi sebuah takeometer di lapangan.

(5 markah)

- (c) The stadia readings with horizontal sight on a vertical staff held 50 m away from a tacheometer were 1.284 and 1.780. The focal length of object glass was 25 cm and the distance between the object glass and the trunnion axis of the tacheometer was 15 cm.

Calculate the stadia interval.

(5 marks)

Bacaan stadia secara ufuk pada staf pugak 50 m dari alat takeometer ialah 1.284 dan 1.780. Jarak fokus kanta objek ialah 25 sm dan jarak di antara teleskop dan paksi sanga takeometer ialah 15 sm.

Kira sela stadia.

(5 markah)

4. (a) A cross-section leveling was carried out in connection with the construction of a canal and the following observations were recorded. The first reading was taken on a TBM of RL 36.324 m.

Satu kerja aras keratan rentas berkaitan dengan pembinaan sebuah terusan telah dijalankan dan cerapan berikut telah dicatat. Bacaan pertama telah dicerap pada BAS dan ALnya ialah 36.324 m.

Left (Kiri)	Distances (Jarak)		BS (PB)	IS (PA)	FS (PH)	RL (m)
	Central (Tengah)	Right (Kanan)				
			1.436			36.324
	0			1.567		
5				1.985		
10				1.342		
15				2.004		
17				2.156		
20				1.986		
25				1.553		
		5		1.967		
		10		2.564		
		13		2.347		
		15	1.986		1.654	
		20		2.220		
		25		1.798		
	10			1.867		
5				1.685		
10				1.842		
15				2.204		
18				2.056		
20				1.786		
25				1.353		
		5		1.767		
		8		2.064		
		10		2.147		
		15		2.006		
		20		1.854		
		25			2.113	

Calculate the reduced levels of all the points by the height of instrument method. Draw the cross sections at central distances 0 and 10 m on a graph sheet. (15 marks)

Dengan menggunakan keadah ketinggian alat, dapatkan nilai-nilai aras laras (AL) bagi kesemua titik. Lukiskan keratan rentas bagi jarak-jarak tengah 0 dan 10 m di atas kertas graf. (15 markah)

- (b) Explain the meaning of the terms 'random errors' and 'systematic errors' and for each, give two (2) examples associated with linear distance measurement using a steel band. (5 marks)

Terangkan maksud istilah 'selisih rawak' dan 'selisih sistematik' dan bagi setiap selisih, beri dua (2) contoh yang berkaitan dengan pengukuran jarak linear menggunakan pita ukur keluli. (5 markah)

5. (a) Discuss the factors on which the selection of the contour interval depends for a map. Explain the main uses of contour map. (10 marks)

Bincangkan faktor-faktor yang perlu diambil kira semasa memilih sela kontur peta. Terangkan kegunaan-kegunaan utama peta kontour. (10 markah)

- (b) Reduced levels of the corners of a series of squares 20 x 20 m have been observed and tabulated as follows.

Aras laras bucu-bucu satu siri segiempat 20 x 20 m telah dicerap dan dijadualkan seperti berikut.

513.0	518.0	527.0	535.0	543.0
522.0	519.0	526.0	537.0	547.0
532.0	533.0	528.0	530.0	537.0
538.0	543.0	533.0	521.0	531.0
546.0	542.0	532.0	515.0	522.0

Draw the contours of 515, 520, 525, 530, 535, 540 and 545 m on the plan using the method of estimation for interpolation. (10 marks)

Lukiskan kontur bagi 515, 520, 525, 530, 535, 540 dan 545 m di atas plan menggunakan kaedah anggaran untuk penentudalaman (interpolasi). (10 markah)

6. (a) Levels were taken across a stream as shown in the diagram below with the staff held on its bed at 3m intervals to determine the discharge. The reduced levels of different points have been calculated as shown below:

Kerja ukur aras merentasi dasar alur seperti dalam gambar rajah di bawah telah dicerap kepada staf pada sela 3 m untuk menentukan buangnya. Aras laras titik-titik tersebut telah dihitung dan dipaparkan seperti di bawah:

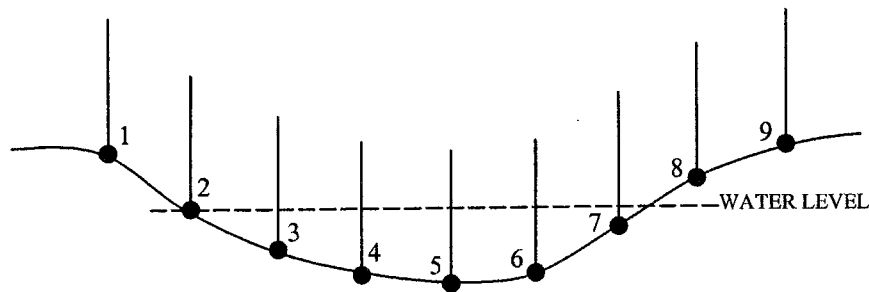
Point no. (No. titik)	1	2	3	4	5	6	7	8	9
RL (AL)	43.775	43.365	43.140	42.570	42.700	42.610	43.235	43.745	44.125

Calculate the area of the water section.

(10 marks)

Kira keluasan kawasan yang dilitupi air.

(10 markah)



Cross-sections of stream (*Keratan rentas alur*)

- (b) A 50 m running track has an embankment built having a formation width of 12 m and side slopes of 2:1. The central height is 5 m and the slope of the original ground surface at right angles to the centre line of embankment is 1:10.

Calculate the volume of the track.

(10 marks)

Satu trek larian 50 m mempunyai benteng dan kelebaran bentukannya ialah 12 m dan cerun sisi ialah 2:1. Ketinggian tengah benteng ialah 5 m dan cerun asal permukaan tanah yang bersudut tepat dengan garis tengah benteng ialah 1:10.

Kira isipadu trek tersebut.

(10 markah)