
UNIVERSITI SAINS MALAYSIA

First Semester Examination
2007/2008 Academic Session

October / November 2007

EAK 263/4 – Geomatic Engineering
[Kejuruteraan Geomatik]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of EIGHT pages of printed materials before you begin the examination.

[Sila pastikan kertas peperiksaan ini mengandungi LAPAN 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 questions 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 sheet.

[Semua jawapan 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. (a) [i] State possible reasons why a two-peg test is required. (3 marks)
Nyatakan sebab-sebab kenapa ujian dua piket perlu dijalankan.

- [ii] What is the purpose of this test? (2 marks)
Apakah tujuan ujian ini?

- (b) A two-peg test was carried out and the following observations were recorded:

Satu ujian dua piket telah dijalankan dan cerapan berikut telah dicatat:

BS PB	IS PA	FS PH	Rise Naik	Fall Turun	Remarks Catatan
1.075					Staff at A; AB = 60 m <i>Staf di A; AB = 60 m</i>
		1.247			Staff at B; instr. midway at C <i>Staf di B; alat di tengah-tengah di C</i>
1.783					Staff at A <i>Staf di A</i>
		1.946			Staff at B; instr. at D, 0.5m right of A on line AB <i>Staf di B; alat di D, 0.5m di sebelah kanan A di atas garisan AB</i>

- [i] Draw a sketch to represent the two instrument positions and show the effect of the collimation error. (2 marks)

Lukis satu lakaran yang menunjukkan kedua-dua kedudukan alat dan kesan selisih kolimatan.

- [ii] Determine the collimation error of the instrument. (6 marks)
Tentukan selisih kolimatan bagi alat tersebut.

- [iii] If the level had been in perfect adjustment, what reading would have been observed at B from the second instrument set-up? (2 mark)

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

[iv] What is the line-of-sight error in 100 m?

(1 mark)

Apakah selisih garis penglihatan pada jarak 100 m?

[v] The engineer decided to continue with the leveling work despite the presence of the collimation error. What steps must be taken to ensure that the errors are reduced and the leveling work is acceptable?

(4 marks)

Jurutera telah memutuskan untuk meneruskan kerja-kerja ukur aras walaupun wujud selisih kolimatan. Apakah langkah-langkah yang perlu diambil supaya selisih dikurangkan dan kerja ukur aras boleh diterima?

2. A group of students carried out a distance measuring task in Cameron Highlands using a steel tape which was standardized at 20°C and supported throughout under a tension of 90N and found to be 30.004 m long.

The tape has a cross-sectional area of 5 mm² and a weight of 40g/m. The tape was used supported at the ends of each section with a constant tension of 70N to measure a line from A to B in 9 segments. The data given below were recorded.

The coefficient of thermal expansion of tape is 0.000 0116 per unit length per °C and Young's Modulus of tape E is 1.92×10^{11} .

Satu kumpulan pelajar menjalankan kerja-kerja pengukuran jarak di Cameron Highlands menggunakan pita keuli yang telah dipiawai pada 20°C dan disokong sepenuhnya pada ketegangan 90N dan jarak didapati 30.004 m.

Luas keratan rentas pita ialah 5mm² dan beratnya ialah 40g/m. Pita yang telah digunakan untuk mengukur garisan AB dalam 9 bahagian telah disokong pada penghujung tiap-tiap bahagian pada ketegangan 70N. Data berikut telah dicatat.

Pekali pengembangan terma pita ialah 0.000 0116 per unit panjang per °C dan Modulus Young pita E ialah 1.92×10^{11} .

Determine the correct length of the line.

(20 marks)

Tentukan jarak sebenar garisan.

Section <i>Bahagian</i>	Measured distance (m) <i>Jarak diukur (m)</i>	Field temp. (°C) <i>Suhu lapangan (°C)</i>	Diff. in elevation (m) <i>Perbezaan ketinggian (m)</i>
A-1	30.000	15	0.381
1-2	30.000	15	0.291
2-3	30.000	16	0.185
3-4	30.000	16	0.245
4-5	30.000	17	0.375
5-6	30.000	17	0.630
6-7	30.000	18	0.772
7-8	30.000	18	0.818
8-B	25.348	19	0.569

3. For the proposed construction of a new school building, a traverse surveying was carried out to furnish the consultant in determining the location of the proposed building and the design of the access road. The abstract of the survey data is given in the following table.

Bagi cadangan pembinaan bangunan baru pusat pengajian, satu ukur travers telah dijalankan untuk dibekalkan kepada pihak perunding bagi tujuan penentuan kedudukan bangunan yang dicadangkan dan rekabentuk jalan masuk. Ringkasan data ukur diberi di dalam jadual berikut.

Line <i>Garisan</i>	Mean included angle <i>Min sudut dalam</i>	Distance (m) <i>Jarak (m)</i>
AB	θ_A 94° 10' 00"	103.401
BC	θ_B 178° 10' 00"	157.251
CE	θ_C 118° 21' 45"	143.359
EG	θ_E 94° 42' 25"	169.082
GJ	θ_G 158° 07' 30"	176.742
JL	θ_J 89° 03' 55"	110.601
LA	θ_L 167° 15' 50"	140.828
Whole-circle bearing of AB = 187° 22' 20" Coordinates of station A is 1000.000mN, 1000.000mE.		
<i>Bearing bulatan penuh AB = 187° 22' 20"</i> <i>Koordinat stesen A ialah 1000.000mU, 1000.000mT.</i>		

- [a] Calculate the bearings of the other traverse lines.

(3 marks)

Kira bearing bagi garisan-garisan travers yang lain.

- [b] Calculate the coordinates of the other survey stations and determine the accuracy of the traverse using the Bowditch's Method. You may use the Traverse Computation Sheet provided.

(15 marks)

Kira koordinat bagi stesen-stesen ukur yang lain dan tentukan kejituan travers menggunakan Rumusan Bowditch. Anda boleh gunakan Borang Pengiraan Travers yang dibekalkan.

- [c] Comment on the results of the survey work achieved.

(2 marks)

Komen ke atas keputusan kerja ukur yang dicapai.

4. [a] In stadia tacheometry, three principal sources of error must be considered to achieve a better accuracy to both the measured length and the difference in height.

Explain how these sources of errors are treated in order to achieve an acceptable accuracy.

(6 marks)

Dalam tekimetri stadia, tiga sumber utama selisih mesti diberi perhatian supaya kejituan yang baik kepada jarak diukur dan perbezaan ketinggian diperolehi.

Terangkan bagaimana sumber-sumber selisih ini ditangani supaya memperoleh kejituan yang boleh diterima.

- [b] A theodolite with a multiplying constant of 100 and no additive constant was set up over station A which is 24.260m above datum. The height of the instrument above station A which has coordinates of 2246.518mN, 2247.031mE is 1.325m. A station B with coordinates of 2047.401mN, 2360.567mE was sighted. Readings were then taken successfully on a staff held vertically on stations P and Q and the observations in the table below were recorded.

If the positive and negative signs in the vertical circle column denote angles of elevation and depression respectively, calculate:

- (i) the horizontal length of PQ;
- (ii) the bearing of PQ; and
- (iii) the height of points X and Y above datum.

(14 marks)

Sebuah tiodolit yang mempunyai pemalar daraban 100 dan tiada pemalar campuran telah didirisiapkan di atas stesen A yang berada 24.260m di atas datum. Ketinggian alat di atas stesen A yang mempunyai koordinat 2246.518mU, 2247.031mT ialah 1.325m. Cerapan ke stesen B yang mempunyai koordinat 2047.401mU, 2360.567mT telah dibuat. Bacaan kepada staf yang berdiri tegak di atas stesen P dan Q telah dibuat dan cerapan ditunjukkan dalam jadual berikut.

Jika tanda positif dan negatif dalam ruangan bulatan pugak masing-masing bermaksud sudut-sudut dongak dan tunduk, kira:

- (i) jarak ufuk PQ;
- (ii) bearing PQ; dan
- (iii) ketinggian titik X dan Y di atas datum.

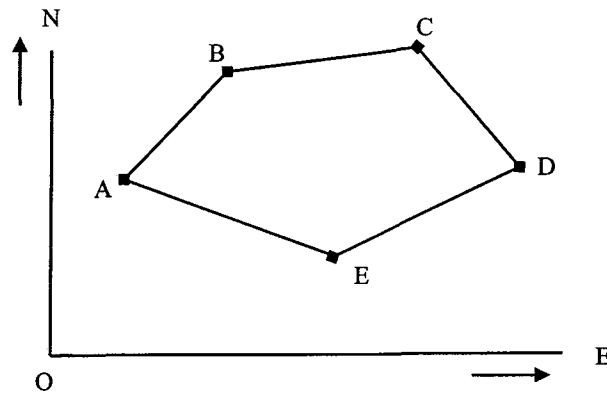
Instr. stn. Stn. alat	Stn. sighted Stn. dicerap	Stadia readings Bacaan stadia	Vertical circle Bulatan pugak	Horizontal circle Bulatan ufuk
A	B	-	-	15° 20' 30"
A	P	2.687, 2.097, 1.508	+01° 15' 20"	22° 28' 55"
A	Q	2.744, 1.965, 1.187	- 02° 04' 50"	141° 15' 40"

5. [a] The figure below described a traverse. The coordinates of stations A, B, C, D and E given in the table are relative to the coordinate axes whose origin is O. Calculate the area of traverse ABCDEA.

(10 marks)

Rajah di bawah menunjukkan sebuah travers. Nilai koordinat bagi stesen A, B, C, D and E dalam jadual merujuk kepada paksi koordinat di mana asalannya ialah O. Kira keluasan travers ABCDEA.

Station Stesen	Coordinates (Koordinat)	
	Eastings Timuran	Northings Utaraan
A	10000.00	20000.00
B	20600.98	28500.65
C	26800.55	18200.02
D	29200.93	14800.80
E	19100.74	8500.70



[b] The cross-sectional area of a proposed road fill sections are as follows:

Luas muka keratan setiap bahagian cadangan pembinaan tambakan jalan adalah seperti berikut.

Chainage (m) Rantaian (m)	0	20	40
Cross-sectional area Luas keratan rentas (m ²)	62.65	68.75	70.55
Chainage (m) Rantaian (m)	60	80	100
Cross-sectional area Luas keratan rentas (m ²)	80.35	82.00	75.70

Determine the total volume over the 100m road span.

(6 marks)

Dapatkan jumlah isipadu tambakan pada keseluruhan jalan 100m panjang.