
UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2006/2007 Academic Session
*Peperiksaan Semester Pertama
Sidang Akademik 2006/2007*

October / November 2006

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 **EIGHT (8)** printed pages before you start your examination.
*Sila pastikan kertas peperiksaan ini mengandungi **LAPAN (8)** muka surat bercetak sebelum anda memulakan peperiksaan ini.*
2. This paper contains **SEVEN (7)** questions. Answer both questions from Part A – Compulsory Question and any **FOUR (4)** from Part B.
*Kertas ini mengandungi **TUJUH (7)** 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 – Soalan Wajib

1. (a) What is the difference between 'geomatic' and 'surveying'? Explain in detail the principles of surveying. Differentiate between plane surveying and geodetic surveying.

(10 marks)

Apakah perbezaan di antara 'geomatik dengan 'ilmu ukur'? Terangkan dengan terperinci prinsip-prinsip ilmu ukur. Nyatakan perbezaan antara pengukuran satah dengan pengukuran geodetik.

- (b) What do you understand by the loop misclosure in leveling? What is an acceptable misclosure, and how is it adjusted?

(5 marks)

Apakah yang anda faham tentang selisih tutupan lop dalam ukur aras? Apakah tikaian diterima dan bagaimanakah ianya dilaraskan?

- (c) The embankment of a proposed road is shown in the figure below. Their dimensions are as follows:-

road width = 20m

existing ground slope = 1 in 10

side slopes = 1 in 2

center height = 10m

Calculate the side width [formation width] and the cross-sectional area.

(5 marks)

Sebuah tambak jalan yang ditunjukkan dalam rajah di bawah mempunyai dimensi seperti berikut:-

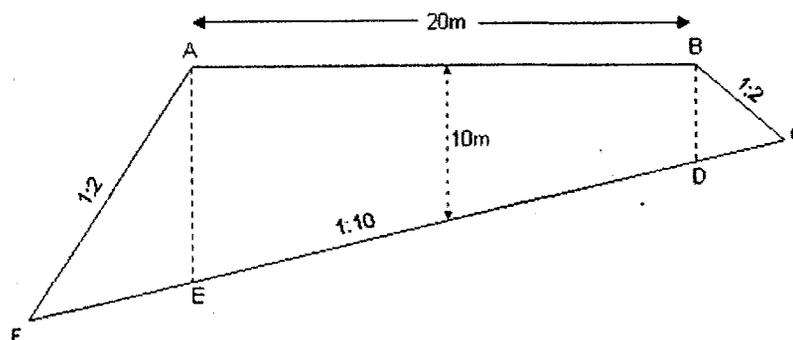
lebar aras bentukan = 20m

cerun permukaan asal = 1 dlm 10

nilai cerun sisi tambakan = 1 dlm 2

ketinggian permukaan tengah = 10m

Kira lebar formasi dan luas muka keratan tambakan tersebut.



2. (a) The following observations were taken with a level and a staff at 10 m intervals along the centre line of a road.

The instrument was shifted after taking the 6th and the 10th readings. Calculate the elevations of all the points if the elevation of the first point is 12.546 m, and apply the usual arithmetic check. Using the data, draw the longitudinal section along the centre line of the road.

(10 marks)

Cerapan berikut telah dibuat menggunakan alat aras dan staf pada sela 10 m di sepanjang garisan tengah jalan raya.

Alat aras telah diubah kedudukannya setelah cerapan yang ke-6 dan ke-10 dibuat. Jika ketinggian titik pertama ialah 12.546 m, gunakan kaedah semakan matematik lazim untuk mengira ketinggian semua titik. Dengan menggunakan data tersebut, lukiskan keratan membujur di sepanjang garis tengah jalan raya.

1.435, 2.456, 2.648, 1.865, 1.456, 2.003, 2.856, 2.953, 3.258, 2.567, 1.065, 2.557, 3.254, and 1.678.

2. (b) Table 1 shows the observations taken in a closed traverse survey using bearing method:

Bearing of line AB was $98^{\circ} 30' 20''$. Fill in all the missing values of face left, face right and the mean bearings. Apply the correction to the bearings and calculate the corrected bearings of all sides.

(10 marks)

Jadual 1 menunjukkan cerapan yang telah dibuat di sebuah travers tertutup menggunakan kaedah bearing:

Bearing garisan AB ialah $98^{\circ} 30' 20''$. Penuhkan nilai bagi penyilang kiri, penyilang kanan dan bearing purata. Buat pembetulan bearing dan kira bearing terlaras bagi semua garisan.

Table 1 (Jadual 1)

| Station (Stesen) | Bearings (Bearing) | | |
|---------------------|-------------------------------|---------------------------------|------------------------|
| | Face Left (Penyilang Kiri) | Face Right (Penyilang Kanan) | Mean (Min) |
| B | A | - | - |
| | C | $30^{\circ} 20' 20''$ | $210^{\circ} 20' 40''$ |
| C | B | - | - |
| | D | $298^{\circ} 30' 40''$ | $118^{\circ} 31' 00''$ |
| D | C | - | - |
| | E | $230^{\circ} 00' 40''$ | $50^{\circ} 01' 00''$ |
| E | D | - | - |
| | A | $150^{\circ} 31' 00''$ | $330^{\circ} 30' 40''$ |
| A | E | - | - |
| | B | $98^{\circ} 32' 20''$ | $278^{\circ} 31' 40''$ |

PART B - Answer any FOUR (4) questions only.

BAHAGIAN B – Jawab mana-mana EMPAT (4) soalan sahaja.

- 3. Differentiate between temporary and permanent adjustments of a level. What are the conditions of permanent adjustment of a level? Explain the two peg test. (15 marks)

Bezakan di antara pelarasan sementara dan pelarasan tetap bagi alat aras. Apakah syarat-syarat untuk pelarasan tetap alat aras? Terangkan ujian dua piket.

- 4. (a) Explain the uses of contour lines with suitable diagrams. (5 marks)

Dengan bantuan gambarajah yang sesuai, terangkan kegunaan garisan kontur.

- (b) A straight tunnel is to be run between two points A and B whose co-ordinates are given in Table 2:

It is desired to sink a shaft at D, the middle point of AB, but it is impossible to measure along AB directly, so D is to be fixed from C, a third known point.

Calculate:

- i. the coordinate of D;
- ii. the length and bearing of CD; and
- iii. the angle ACD, given that the bearing of AC is $52^{\circ} 58' 55''$.

(10 marks)

Satu terowong lurus akan dibina di antara titik A dan titik B dan koordinat adalah seperti di Jadual 2:

Satu syaf dikehendaki dibenam di D, iaitu titik tengah bagi garisan AB, tetapi pengukuran garisan AB secara langsung tidak dapat dilakukan. Maka D perlu ditetapkan dari C, iaitu titik ketiga yang diketahui.

Kira:

- i. koordinat bagi D;
- ii. panjang dan bearing CD; dan
- iii. sudut ACD, di mana bearing AC adalah $52^{\circ} 58' 55''$.

Table 2 (Jadual 2)

| Point (Titik) | Coordinates (Koordinat) | |
|------------------|-------------------------|-------|
| | N (U) | E (T) |
| A | 0 | 0 |
| B | 2514 | 348 |
| C | 1854 | 1408 |

5. (a) A tacheometer fitted with an anallatic lens and having its constant 100, was set up at station C and the following observations were made from station C (Table 3).

Calculate the horizontal distance and difference of elevation between the points A and B, and the gradient of the line joining the points A and B.

(10 marks)

Satu takeometer yang dilengkapi kanta analatik dan pemalar 100 telah didirisiapkan di stesen C dan cerapan berikut telah dibuat dari stesen C (Jadual 3).

Kira jarak ufuk dan perbezaan ketinggian di antara titik A dan B serta kecerunan garisan yang menghubungkan titik-titik A dan B.

Table 3 (Jadual 3)

| Stations sighted (Stesen dicerap) | Bearing (Bearing) | Stadia readings (Bacaan stadia) | Vertical angle (Sudut pugak) |
|--------------------------------------|----------------------|------------------------------------|---------------------------------|
| A | 315° 43' 40" | 1.015, 1.850, 2.685 | +06° 36' 30" |
| B | 55° 40' 20" | 0.865, 2.310, 3.755 | - 02° 24' 50" |

- (b) Write short notes on any one of the following:

- (i) Offsets in linear measurements
- (ii) Corrections to linear measurements by a tape

(5 marks)

Tulis nota ringkas bagi mana-mana satu yang berikut:

- (i) *Offset dalam pengukuran linear*
- (ii) *Pembetulan kepada pengukuran linear menggunakan pita*

6. (a) Briefly, explain the difference between the following terms:

- i. level line and horizontal line;
- ii. line of collimation and axis of telescope;
- iii. face left and face right observations; and
- iv. transiting and swinging of telescope.

(6 marks)

Terangkan secara ringkas perbezaan istilah-istilah berikut:

- i. *garis aras dan garis ufuk;*
- ii. *garis kolimat dan paksi teleskop;*
- iii. *cerapan penyilang kiri dan penyilang kanan; dan*
- iv. *transit dan pusingan.*

6. (b) Reciprocal observations as given in the following Table 4 were taken with a tilting level between the points A and B.

The distance between points P and Q is 50 m. If the R.L. of station P is 24.143 m, calculate:

- (i) R. L. of station Q.
- (ii) angular error in the line of collimation stating clearly whether it is inclined upward or downward; and
- (iii) the corrected staff reading at P when the instrument is at Q.

(9 marks)

Cerapan salingan telah dibuat dengan alat aras jongket di antara titik A dan B dan nilai cerapan adalah seperti di Jadual 4.

Jarak di antara titik P dan Q ialah 50 m. Jika aras terlaras (R.L) stesen P ialah 24.143 m, kira:

- (i) aras terlaras stesen Q.*
- (ii) selisih sudut pada garis kolimat dengan menerangkan samada ia menurun atau menaik; dan*
- (iii) bacaan staf terlaras P apabila alat berada di Q.*

Table 4 (Jadual 4)

| Instrument near station (Alat dekat stesen) | Staff readings at stations (Bacaan staf di stesen) | |
|--|---|-------|
| | P | Q |
| P | 1.728 | 1.477 |
| Q | 2.250 | 1.906 |

7. (a) The following offsets were taken at 20 m intervals from a survey line to an irregular boundary.

Calculate the area enclosed between the survey line and the irregular boundary using the following formula:-

- i. Mean Ordinate Rule;
- ii. Trapezoidal Rule; and
- iii. Simpson Rule.

(8 marks)

Nilai-nilai ofset berikut telah diambil daripada garis ukur ke sempadan kawasan tidak sekata pada setiap 20m rantaian.

Kira keluasan kawasan di antara garis ukur dan sempadan tidak sekata menggunakan rumusan berikut:

- i. Aturan Ordinat Purata;*
- ii. Aturan Trapezoid; dan*
- iii. Aturan Simpson.*

| | | | | | | | | |
|--------|--------|-------|-------|-------|-------|--------|--------|-------|
| 12.0m, | 10.0m, | 8.0m, | 6.0m, | 4.0m, | 6.0m, | 10.0m, | 16.0m, | 24.0m |
|--------|--------|-------|-------|-------|-------|--------|--------|-------|

- (b) Briefly explain **THREE (3)** different methods of determining volume of earthwork in a construction process. Describe their advantages and disadvantages.

(7 marks)

*Terangkan secara ringkas **TIGA (3)** kaedah pengiraan isipadu kerja tanah dalam kerja-kerja pembinaan. Huraikan kelebihan dan kekurangan setiap kaedah yang dibincang.*