UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007
Peperiksaan Semester Kedua
Sidang Akademik 2006/2007

April 2007

EBS 329E/3 - Engineering Geophysics
EBS 329E/3 - Geofizik Kejuruteraan

Time : 3 hours
Masa : 3 jam

Please ensure that this paper consists of NINE printed pages before you proceed with the examination.

This paper contains SEVEN questions. TWO questions in PART A and FIVE questions in PART B.

Answer any FIVE questions. Please answer ALL questions in PART A and any THREE questions in PART B. If a candidate answers more than five questions, only the first five answers will be examined and awarded marks.

Please use the provided log-log or linear graphs papers whenever necessary.

Answer to any question must start on a new page.

All questions could be answered in Bahasa Malaysia or English.

Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat yang bercetak sebelum anda memulakan peperiksaan.

Kertas soalan ini mengandungi TUJUH soalan. DUA soalan di BAHAGIAN A dan LIMA soalan di BAHAGIAN B.

Jawab LIMA soalan. Sila jawab SEMUA soalan di BAHAGIAN A dan mana-mana TIGA soalan di BAHAGIAN B. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.

Sila guna kertas graf linear dan log-log yang disediakan sekiranya perlu.

Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru.

Semua soalan boleh dijawab samada dalam Bahasa Malaysia atau Bahasa Inggeris.

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PART A

BAHAGIAN A

1. Answer the following questions.

[a] Discuss constrains on seismic velocity. What is the P velocity of the geological formation which buried at the depth of 200m below ground surface and aged about 100 millions years?

[b] The following seismogram shows a result of refraction survey along a survey line. Short point is located at 98.0m (Data file : 1000.dat).

(i) Plot the Time-Distant (T-D) or travel time curve?
(ii) Determine the velocities, V of top (overburden) and reflector (bedrock).
(iii) Determine the thickness, t of the overburden.

(Notes : This is a two layers case with horizontal or planer interfaces)

(20 marks)

1. Jawab kesemua soalan-soalan berikut.

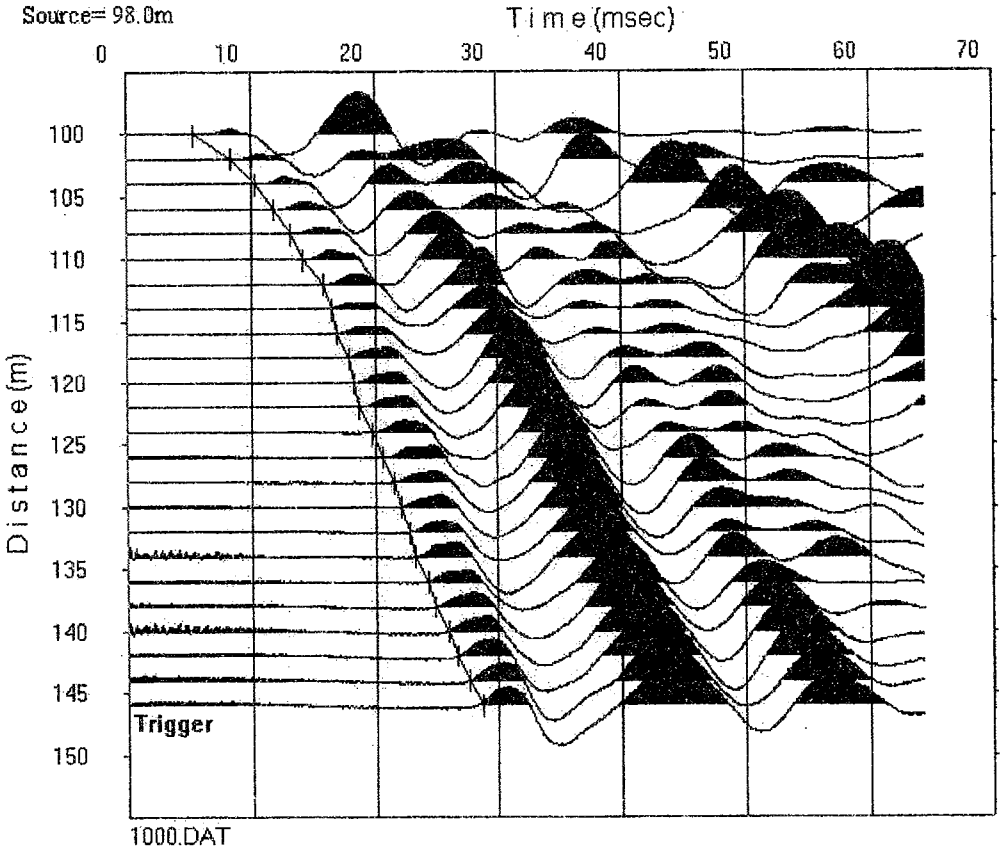
[a] Bincangkan kekangan dalam halaju seismik. Apakah halaju gelombang P bagi formasi geologi yang tertimbus pada kedalaman 200m di bawah paras permukaan bumi dan berumur sekitar 100 juta tahun?

[b] Berikut adalah seismogram hasil daripada satu profil survei seismik biasan. Titik tembak (SP) terletak pada kedudukan 98.00m (Fail data : 1000.dat).

(i) Plot lengkung Masa-Jarak (T-D) atau lengkung masa perembatan?
(ii) Tentukan halaju, V lapisan beban atas dan pembalik (batuan dasar)?
(iii) Tentukan ketebalan, t lapisan beban atas.

(Nota : Ini adalah kes dua lapisan dengan lapisan antaramuka mendatar)

(20 markah)



Data file : 1000.dat

Fail Data : 1000.dat

2. Briefly describe or define any **five (5)** of the following?

[a] Geophysical anomalies

[b] Environmental geophysics (application)

[c] Earthquake seismology

[d] Relative gravity (in gravity survey)

[e] Background potential (in SP survey)

[f] Active/artificial method (in geophysical survey principle)

(20 marks)

2. *Terangkan secara ringkas atau takrifkan* ***lima (5)*** *perkara-perkara berikut.*

[a] Anomali geofizik

[b] Geofizik persekitaran (aplikasi)

[c] Seismologi gempa bumi

[d] Graviti bandingan (dalam survei graviti)

[e] Keupayaan latar (dalam survei SP)

[f] Kaedah aktif/palsu (dalam prinsip survei geofizik)

(20 markah)

PART B

BAHAGIAN B

3. Answer all of the following questions.

[a] There are three (3) different of geoelectrics methods on the basis of their electrical property. State and briefly describe these methods.

[b] Gravity surveys measures the acceleration due to gravity, g. Gravitational attraction depends on the density of underlying rocks, to which gravity survey are sensitive. So value of g varies across the surface of earth. State and briefly describe three (3) major scales (magnitude) of gravity survey which are carried out for different purposes.

[c] Magnetic susceptibility, κ is the physical parameter to which magnetic surveys are sensitive. States three (3) main applications of this survey method.

[d] What is body wave? States types and characteristics of these waves.

(20 marks)

3. Jawab kesemua soalan berikut.

[a] Terdapat tiga (3) kaedah survei geoelektrik yang berlandaskan kepada sifat-sifat elektrik yang berlainan. Nyata dan bincangkan secara ringkas kaedah-kaedah ini.

[b] Survei graviti mengukur pecutan akibat pengaruh graviti, g. Tarikan graviti bergantung kepada ketumpatan bahan bumi (batuan) yang amat sensitif kepada survei graviti. Oleh yang demikian nilai g adalah berubah-ubah daripada satu kawasan ke kawasan yang lain. Nyata dan bincangkan secara ringkas tiga (3) sekala (magnitud) survei yang lazim dijalankan untuk maksud tertentu.

[c] Kerantanan magnetik, κ adalah parameter fizikal yang sensatif kepada survei magnet. Nyatakan tiga kegunaan utama survei magnetik.

[d] Apakah itu gelombang jasad? Nyatakan jenis-jenis dan ciri-ciri gelombang tersebut.

(20 markah)

4. Answer all of the following questions.

[a] State and describe the similarity and differences between gravity and magnetic methods.

[b] Several corrections must be applied to observed gravity data to obtain sea level reference and anomaly. State and explains at least three (3) of these data correction.

[c] What is "Local Latitude Correction"? Estimate the local latitude correction at 51° N (unit gu/km).

[d] Write the final Bouger anomaly formula.

(20 marks)

4. Jawab kesemua soalan berikut.

[a] Nyata dan perihalkan persamaan dan perbezaan antara kaedah-kaedah graviti dan magnetik.

[b] Beberapa proses pembetulan terhadap data graviti cerapan perlu dilakukan terlebih dahulu sebelum memperolehi rujukan paras laut dan anomali-anomali. Nyata dan terangkan sekurang-kurangnya tiga (3) jenis pembetulan data ini.

[c] Apakah itu "Pembetulan latitud tempatan"? Anggarkan nilai pembetulan latitud tempatan pada 51° N (unit gu/km).

[d] Tuliskan rumus untuk anomali Bouger (akhir).

(20 markah)

5. Answer all of the followings questions.

[a] Define or describe the following

(i) Electrode arrays (in resistivity survey) and geometrics factors.

(ii) Apparent resistivity.

[b] Plot the following resistivity data **(Table 1)** and determine the resistivity of layers 1 and 2 and thickness of layer 1 for the given data?

(Master curve and graph paper (log-log) are provided)

(20 marks)

5. *Jawab kesemua soalan berikut.*

[a] Takrif atau jelaskan perkara-perkara berikut.

(i) Susunan/tatarajah elektrod (dalam survei resistiviti dan faktor geometrik?.

(ii) Resistiviti nyata.

*[b] Plot data resistiviti berikut **(Jadual 1)** dan tentukan nilai resistiviti lapisan 1 dan 2 serta ketebalan lapisan 1 untuk data yang diberikan.*

(Lengkung master dan kertas graf (log-log) adalah disediakan)

(20 marks)

Table 1 - Resistivity Data (Wenner Configuration)

Jadual 1 - Data Resistiviti (Konfigurasi Wenner)

"a" spacing (meters) *Jarak "a" (meters)*	**Apperent resistivity (ohm-meters)** *Resistiviti nyata (ohm-meters)*
5	210
10	276
15	360
20	450
30	610
50	850
100	1210

7. Answer all of the following questions.

[a] There are two main methods in resistivity (VES and CST). State and briefly discuss the procedures and advantages or usage of these methods.

[b] State the typical uses of electrical resistivity survey and factors that governed resistivity (increasing or reducing).

[c] What is geophone? State main applications of seismic refraction in engineering geology/geophysics.

[d] What are the measuring units for apparent resistivity, gravity, magnetic and Self-Potential (SP)?

(20 marks)

7. *Jawab semua soalan berikut.*

[a] Terdapat dua kaedah utama perlaksanaan survei resistiviti (VES dan CST). Nyata dan bincangkan secara ringkas prosedur dan kesesuaian penggunaan kaedah-kaedah ini.

[b] Nyatakan kegunaan lazim survei elektrik resistiviti dan faktor-faktor yang mengekang/mempengaruhi nilai resistiviti (meningkat dan mengurangkan).

[c] Apakah itu geofon? Nyatakan aplikasi utama seismik biasan dalam kejuruteraan geologi/geofizik.

[d] Apakah unit-unit pengukuran resistiviti nyata, graviti, magnetik dan keupayaan-diri (SP)?

(20 markah)

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