

**PART A / BAHAGIAN A**

- (1). In geophysical survey, a variation in physical properties relative to some background value due to burial target is call as (*Dalam survey geofizik, variasi dalam sifat fizikal adalah relatif kepada nilai latar belakang berpunca daripada sasaran tertimbus dikenali sebagai?*)
- Geophysical target (*Sasaran geofizik*)
  - Geophysical anomaly (*Anomali Geofizik*)
  - Residual effects (*Kesan baki*)
  - Responding values (*Nilai-nilai tindak balas*).
- (2). Which geophysical survey is the most appropriate method for mapping of leachate and contaminant plumes and sub-surface cavities (*Kaedah geofizik yang manakah lebih bersesuaian bagi memetakan tumpukan pencemaran dan rongga bawah tanah*) ?
- Gravity(*graviti*)
  - Resistivity(*keberintangan/resistivi*)
  - Self-Potential(*Keupayan diri*)
  - Seismic refraction(*Seismik biasan*)
- (3). A ground penetrating radar (GPR) normally comprises the following functional components in its system, EXCEPT (*Radar penusukan bumi (GPR) lazimnya mempunyai komponen-komponen fungsian dalam sistemnya , iaitu **KECUALI**?*)
- Receiving and transmitting antennae (*Antena penerima dan pemancar*)
  - Radargram display unit (*unit paparan radargram*)
  - Ground sensing unit(*unit pengesanan bumi*)
  - Signal generator (*penjana isyarat*)

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- (4). In GPR system, the speed of radiowaves in any medium is dependent upon, **EXCEPT** (*Dalam sistem GPR, kelajuan gelombang radio dalam pelbagai media adalah bergantung kepada **KECUALI***)?
- speed of the light (*kelajuan cahaya*)
  - relative dielectric constant (*pemalar dielektrik relatif*)
  - relative magnetic permeability (*ketelapan magnet relatif*)
  - wavelength (*panjang gelombang*)
- (5). The electromagnetic polarisable characteristics of the radio waves are more analogous to (*Ciri koboleh polaran electromagnet gelombang radio adalah andaian/anologi bagi*)?
- Seismic P-wave (*Seismik gelombang-P*)
  - Seismic S-wave (*Seismik gelombang-S*)
  - Love wave (*Gelombang Love*)
  - Surface wave (*Gelombang permukaan*).
- (6). Typical resistivities of geologic material are reduced by , **EXCEPT** (*Keberintang lazim bahan geologi berkurangan dengan, **KECUALI***)?
- Increasing in porosity (*Peningkatan dalam keporosan*)
  - Increasing in depth (*Peningkatan kedalaman*)
  - Increasing content of clay (*Pertambahan kandungan lempung*)
  - Decreasing grain size (*Pengurangan saiz butiran*)

- (7). Induced Potential (IP) is similar to resistivity, but in this method the following is monitored (*Keupayan teraruh (IP) adalah mirip kepada keberintangan/resistivity, akan tetapi dalam kaedah ini perkara berikut dimonitor*)?
- Instantaneous of decay potential - chargeability of a medium (*penyusutan keupayaan mendadak*)
  - The resistivity of mediums (*Keberintangan media*)
  - Natural potential differences on the surface of the earth (*Perbezaan keupayaan tabii di permukaan bumi*)
  - Potential difference created from chemical reaction (*Perbezaan keupayaan terbentuk akibat tindakbalas kimia*)
- (8).  $g_{obs} - g_n + 0.3086 h - 0.04193 \rho h$  (mgal) is a data gravity corrected expression up to ( $g_{obs} - g_n + 0.3086 h - 0.04193 \rho h$  (mgal) *adalah data pembetulan data gravity bagi*)?
- Terrain (*T*)
  - Latitud (*T*)
  - Bouguer gravity (*T*)
  - Free air (*T*)

- (9). P-wave propagates through a medium depends on the physical properties or characteristic of the rock, **EXCEPT** (*Gelombang-P merambat menerusi medium dengan bergantung kepada sifat fizik atau ciri-ciri batuan, **KECUALI***)?
- Rigidity and density (*Kakuan dan ketumpatan*)
  - Rock type (*Jenis batuan*)
  - Degree of homogeneity of the rock (*Darjah kehomogeanan batuan*)
  - Saturation (*Ketepuan*)
- (10). Electric circuit has three main components, **EXCEPT** (*Litar elektrik mempunyai tiga komponen utama, **KECUALI***)?
- Inductance (L) (*Kearuhan*)
  - Resistance (R) (*Kerintangan*)
  - Capacitance (C) (*Kapasitan*)
  - Magnetising (M) (*Kemagnetan*)
- (11). There are two main resistivity survey methods can be conducted, what Constant Separation Traversing (CST) method refers to (*Terdapat dua cara pelaksanaan survei keberintangan, Terhadap apakah kaedah CST itu merujuk*)?
- Lateral variation in resistivity (*Variasi keberintangan mendatar*)
  - Depth variation in resistivity (*Variasi keberintangan mendalam*)
  - Measurement of repeat resistivity (*Pengukuran tetap keberintangan*)
  - Electrode configuration separation (*Pemisahan konfigurasi elektrod*)

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- (12). There are three ways in which electric current can be conducted through rock, **EXCEPT?**
- Electrolytic (*Elektrolitik*)
  - Electrokinetic (*Elektrokinetik*)
  - Electronic conduction (*Pengaliran elektronik*)
  - Dielectric Conduction (*Pengaliran dielektrik*)
- (13). Which statement is **untrue** about SP (*Kenyataan yang manakah salah mengenai SP*)?
- A passive method (*Suatu kaedah pasif*)
  - Possess positive and negative anomaly (*Mempunyai anomaly positif dan negatif*)
  - Depends on geometry factors (*Bergantung kepada faktor geometri*)
  - Measured between two points on the ground surface (*Diukur antara dua titik pada permukaan bumi*)
- (14). Typically, two corrections often applied to SP data: (*Pada kelazimanya, dua pembetulan dilakukan kepada data SP, iaitu*)?
- Heavy rainfall and latitude effects (*Kesan hujan lebat dan latitud*)
  - Regional trend and Bioelectric effects (*kesan trend serantau dan bioelektrik*)
  - Electrode configurations and orientation effects (*Kesan konfigurasi elektrod dan orientasi*)
  - Mineral and background potential effects (*Kesan mineral dan keupayaan latar*)

- (15). \_\_\_\_\_ aims to investigate the subsurface geology by measuring the strength or intensity of the Earth's magnetic field. In magnetic survey the measurement unit used is \_\_\_\_\_ (*Tujuan \_\_\_\_\_ adalah untuk menjiwasat geologi sub-permukaan dengan mengukur kekuatan medan magnetic bumi. Dalam survey magnet unit pengukuran ialah \_\_\_\_\_*)?
- Resistivity survey, volts·s·m<sup>-2</sup> (*Survei keberintangan, volts·s·m<sup>-2</sup>*)
  - Electromagnetic survey, nanotesla (nT) (*Survei electromagnet, nanotesla (nT)*)
  - Magnetic survey, tesla (T) (*Survei magnet, tesla (T)*)
  - Magnetic survey, (*Survei magnet, nanotesla (nT)*)
- (16). Typical geophone construction consists, **EXCEPT** (*Binaan lazim sebuah geofon mengandungi, **KECUALI***)?
- Terminal cables/wires (*Terminal kabel/wayer*)
  - Magnet and Coil (*Magnet dan gelung*)
  - Accelerometer (*Meter pecutan*)
  - Top and bottom spring (*Spring atas dan bawah*)
- (17). In resistivity survey, the following statements refer to which electrode configuration?  
"All for electrodes have to be moved for each measurement"  
(*Dalam survei keberintangan, kenyataan berikut adalah merujuk kepada konfigurasi ?*)  
"Semua elektrod mesti digerak/pindah bagi setiap pengukuran"
- Wenner
  - Schlumberger
  - Square (*segi-empat*)
  - Dipole-dipole

(18). The followings are the important parameters that are significance to the principles of seismic reflection characteristics, **EXCEPT**  
*Berikut adalah parameter yang sangat bererti kepada prinsip ciri-ciri seismik biasanya?*

- a. Acoustic Impedance : Z
- b. Reflection Coefficient: R
- c. Transmission Coefficient: T
- d. Amplitude Coefficient:A

(19). In gravity survey, data correction which refers to the effect of instrument sensitivity and accuracy due to temperature or spring factors is known as

*Dalam survei gravity pembetulan data yang merujuk kepada kesentiviti dan ketepatan alat terhadap suhu atau spring dikenali sebagai?*

- a. Latitude correction (*Pembetulan latitud*)
- b. Tidal correction (*pembetulan pasang surut*)
- c. Drift correction (*Pembetulan rayapan*)
- d. Terrain correction (*Pembetulan terrain*)

(20). Gravity methods are sensitive to density contrasts within the sub-surface and so are ideal for exploring

*Kaedah graviti amat sensitif kepada perbezaan ketumpatan dalam sub-permukaan dan ianya ideal bagi penjelelahan)?*

- a. Forensic geophysics (*Geofizik forensik*)
- b. Hydrological investigation (*Penyiasatan hidrologi*)
- c. Major sedimentary basin study (*Kajian lembangan sedimen utama*)
- d. Engineering site investigations (*Penyiasatan tapak kejuruteraan*)

(20 marks/markah)

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**PART B / BAHAGIAN B**

1. Briefly discuss or elaborate the followings?

*Secara ringkas takrif atau terangkan perkara-perkara berikut?*

(a). Characteristics of a geophone and selection criteria in seismic survey

*Ciri-ciri sebuah geofon dan criteria pemilihannya dalam survey geofizik?*

(b). Advantage of Geophysics method

*Kebaikan kaedah geofizik?*

(c). Factors that govern the behavior and rate of seismic wave propagation velocities (P and S wave) through any given medium/geological materials for example in sedimentary rocks

*Faktor yang mengawal kelakuan dan kadar halaju rembatan gelombang (P dan S) menerusi media/ bahan geologi seumpama batuan sedimen?*

P wave is function of age and depth of rock. Determine the seismic velocity of underlying rock formation which thickness is 500 meter and geological age of 400 million years

*Gelombang P adalah fungsi usia dan kedalaman timbusan batuan. Tentukan halaju seismik formasi batuan dengan ketebalan 500 meter dengan usia geologi 400 juta tahun?*

*(20 marks/markah)*

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(2). Answer all the following questions

*Jawab semua soalan berikut*

(a). Briefly explain the following

*Secara ringkas terangkan maksud perkara-perkara berikut*

(i). Magnetic susceptibility,  $k$  (in magnetic survey)

*Kerentanan magnet,  $k$  (di dalam survey magnet)*

(ii). Passive and active geophysical survey

*Survei geofizik pasif dan aktif*

(b). Briefly discuss the major aspects that control the properties and behavior of radio wave propagation of a material/medium in Ground Penetrating Radar (GPR) application concept. List down the major application of GPR.

*Secara ringkas bincangkan aspek-aspek yang mengawal sifat-sifat serta kelakuan sesuatu bahan/media dalam prinsip penggunaan Geologi Radar Penusukan (GPR). Juga senaraikan penggunaan utama GPR?*

*(20 marks/markah)*

(3). Answer all the following questions (*Jawab semua soalan berikut*)

(a). SP surveying is very simple. Please show and describe the basic characteristics of the device use in the survey and the two typical survey methods of SP

*Survei penyiasatan SP adalah mudah. Sila tunjuk dan terangkan ciri-ciri asas peralatan yang diguna dalam survei ini dan dua kaedah survei yang lazim diamalkan?*

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- (b). Rock can become permanently magnetized in the earth's magnetic field; Primary remnant magnetization refers to permanent magnetization created during formation of a rock. What are Thermal Remnant Magnetization (TRM) and Detrital Remnant Magnetization (DRM)

*Batuan boleh bertukar termagnet secara kekal dalam medan magnet bumi; Kemagnetan baki primer adalah merujuk kepada pemagnetan kekal wujud semasa pembentukan suatu batuan itu. Apakah itu pemagnetan baki haba (TRM) dan pemagnetan baki detrital?*

*(20 marks/markah)*

- (4). Answer all the following questions

*Jawab semua soalan berikut*

1. Please specify five (5) major application of  
*Sila nyatakan lima (5) aplikasi utama bagi*

- (i). Seismic refraction in subsurface engineering investigation  
*Seismik biasanya dalam penyiasatan kejuruteraan sub-permukaan*
- (ii) Earth resistivity survey (ERT)  
*Survei resistiviti bumi*

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- (b). What are the differences between regional and residual anomalies in gravity survey? Also states types of corrections normally taken during gravity data correction process

*Apakah perbezaan antara anomaly rantau dan anomali baki dalam survei gravity? Nyatakan juga jenis-jenis pembetulan yang biasanya diambil semasa proses pembetulan data graviti itu)?.*

Write down a general equation of gravity corrections for final Bouguer anomaly

*Tuliskan formula umum pembetulan data graviti bagi anomali Bouguer?*

*(20 marks/markah)*

- (5). Answer all the following questions

*Jawab semua soalan berikut*

- (a). Briefly explain the meaning of the following parameters/terminologies that are essential or related in seismic reflection data processing

*Secara ringkas terangkan maksud parameter/terminologi penting atau berkaitan dengan pemrosesan data seismik pantulan?*

- (i). Common Depth Points (CDP) and Common Mid Point (CMP)

*Titik kedalaman sepunya (CDP) dan Titik Tengan Sepunya (CMP)*

- (ii). A Seismic reflector

*Pemantul seismic*

- (iii). Streaming

*Penstriman*

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- (b). What are the electrode configuration/array and geometric factors, list down and illustrates the most common of these electrode arrays

*Apakah itu konfigurasi/susunan elektrod dan faktor geometri. Senaraikan dan ilustrasi susunatur utama elektrod itu?*

Discuss two main survey/investigation methods practices in earth resistivity techniques

*Bincangkan dua kaedah/penyiasatan utama yang lazim diamalkan dalam survei keberintangan elektrik ini?*

(20 marks/markah)

- (6). Answer all the following questions

*Jawab semua soalan berikut*

- (a). Discuss the effects of earth shape with regard to the variation of gravity values

*Bincangkan kesan-kesan bentuk muka bumi terhadap variasi nilai graviti bumi?*

- (b). The following *Table B* shows the arrival time-distance data collected from a single forward short profile of a seismic refraction survey over a flat landscape

*Jadual B berikut menunjukkan data ketibaan masa-jarak yang diperolehi daripada survei seismic pembiasaan di kawasan landskap yang mendatar*

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TABLE B : Seismic Refraction survey data sheet

JADUAL B : Lembaran data survei Seismik biasan

<b>Geophone (Geofon)</b>	<b>Location Lokasi, x (m)</b>	<b>Arrival times (Masa tiba)</b>
1	201	3
2	205	13
3	209	23
4	213	33
5	217	41.5
6	221	46
7	225	50
8	229	56
9	233	59
10	237	63
11	241	67
12	245	71

- (i). Plot travel-time graph or T-X plot  
*Plotkan graf jarak perjalanan-masa atau T-X?*
  
- (ii). Determines velocities of layers (horizontal layers)  
*Tentukan halaju-halaju (lapisan-lapisan mendatar)*
  
- (iii). Thickness of upper layer,  $t$   
*Ketebalan lapisan teratas*

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- (c). What is Free Air Corrected Gravity (*gfa*)? The form of the Free-Air gravity anomaly, *gfa*, is given by  
*Apakah itu pembetulan graviti udara bebas (gfa)? Bentuk anomaly gfa adalah diberikan oleh*

$$gfa = gobs - gn + 0.3086 h \text{ (mgal)}$$

Determine the *Corrected gravity (gfa)* at a gravity station located near 36.37840544N with elevation of 448.96m from geoid?. The gravimeter reading after tidal and drift correction is 979149.9 mgal

*Tentukan nilai Pembetulan graviti (gfa) pada suatu stesen graviti yang terletak berhampiran 36.37840544N dengan elevasi 448.96m daripada geoid?*

(20 marks/markah)

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