

PART A / BAHAGIAN A

Answer all questions. Please choose the most appropriate answer

Jawab semua soalan. Sila pilih jawapan yang paling tepat

- (1). In geophysical survey, a variation in physical properties relative to some background value due to burial target is called as?

Dalam tinjauan geofizik, perubahan sifat-sifat fizik adalah relatif kepada sasaran tertimbus yang dikenali sebagai?

- (a). Geophysical target/ *Sasaran Geofizik*
- (b). Geophysical anomaly/ *Anomali Geofizik*
- (c). Residual effects/ *Kesan sisa*
- (d). Responding values/ *Nilai-nilai tindakbalas*

- (2). In GPR system, the speed of radio waves in any medium is dependent upon all of these factors, **EXCEPT?**

*Dalam sistem GPR, kelajuan gelombang radio dalam sebarang medium bergantung terhadap kesemua factor dibawah, **KECUALI?***

- (a). Speed of the light/ *Kelajuan cahaya*
- (b). Relative dielectric constant/ *Pemalar relatif dielektrik*
- (c). Relative magnetic permeability/ *Ketelapan magnetik relatif*
- (d). Wavelength/ *Panjang gelombang*

- (3). Induced Potential (IP) is similar to resistivity, but in this method the following is monitored?

Potensi teraruh (IP) adalah serupa dengan keberintangan, tetapi dalam kaedah ini perkara berikut diperhatikan?

- (a). Instantaneous of decay potential - chargeability of a medium
Keupayaan pereputan seponan – kebolehcaj suatu medium
- (b). The resistivity of mediums/ *Keberintangan medium*
- (c). Natural potential differences on the surface of the earth
Perbezaan potensi semulajadi dipermukaan
- (d). Potential difference created from chemical reaction
Perbezaan keupayaan dijana oleh tindakbalas kimia

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- (4). $g_{obs} - g_n + 0.3086 h - 0.0419h$ (mgal) is a corrected data gravity expression up to the following **EXCEPT**
 *$g_{obs} - g_n + 0.3086 h - 0.0419h$ (mgal) adalah pembedulan data graviti hingga ke peringkat, berikut **KECUALI***
- (a). Terrain/ *Rupa bumi*
 - (b). Latitude/ *Latitud*
 - (c). Bouguer gravity/ *Graviti Bouguer*
 - (d). Free air/ *Udara bebas*
- (5). P-wave propagates through a medium depending on the physical properties or characteristics of the rock, **EXCEPT**
*Gelombang P merambat menerusi suatu medium bergantung kepada sifat atau ciri-ciri batuan, **KECUALI***
- (a). Rigidity and density/ *Ketegaran dan ketumpatan*
 - (b). Rock type/ *Jenis batuan*
 - (c). Degree of homogeneity of the rock
Darjah kehomogenan batuan
 - (d). Saturation/ *Ketepuan*
- (6). Which statement is **UNTRUE** about SP
Kenyataan mana yang tidak benar mengenai SP
- (a). A passive method/ *Suatu kaedah pasif*
 - (b). Possess positive and negative anomaly
Mempunyai anomali positif dan negatif
 - (c). Depends on geometry factors
Bergantung kepada faktor geometri
 - (d). Measured between two points on the ground surface
Diukur antara dua titik di permukaan tanah

- (7). Typically, two corrections often applied to SP data:
Lazimnya, dua pembetulan dilakukan terhadap data SP
- (a). Heavy rainfall and latitude effects/ *Kesan hujan lebat dan latitud*
 - (b). Regional trend and Bioelectric effects
Kesan corak serantau dan bioelektrik
 - (c). Electrode configurations and orientation effects
Konfigurasi elektrod dan orientasi
 - (d). Mineral and background potential effects
Kesan potensi mineral dan latar belakang
- (8). Typical geophone construction consists of the following, **EXCEPT**
*Binaan lazim geofon terdiri daripada perkara-perkara berikut, **KECUALI***
- (a). Terminal cables/wires/ *Terminal kabel/wayar*
 - (b). Magnet and Coil/ *Magnet dan gelong*
 - (c). Accelerometer/ *Pemecut*
 - (d). Top and bottom spring/ *Spring atas dan bawah*
- (9). In resistivity survey, the following statement refer to which electrode configuration
Dalam tinjauan keberintangan, kenyataan berikut merujuk kepada konfigurasi elektrod
- “All for electrodes have to be moved for each measurement”
Kesemua elektrod perlu digerakkan untuk setiap pengukuran
- (a). Wenner/ *Wenner*
 - (b). Schlumberger/ *Schlumberger*
 - (c). Square/ *Empat segi*
 - (d). Dipole-dipole/ *Kutub-kutub*

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- (10). There are two main resistivity survey methods. What does Constant Separation Traversing (CST) method refers to
Terdapat dua kaedah survei keberintangan elektrik. Kaedah Pemisahan Tetap (CST) adalah merujuk kepada
- (a). Lateral variation in resistivity/ *Variasi keberintangan mendatar*
 - (b). Depth variation in resistivity/ *Variasi kedalaman keberintangan*
 - (c). Measurement of repeat array/ *Susunatur pengukuran berulang*
 - (d). Electrode configuration/ *Konfigurasi elektrod*
- (11). Gravity methods are sensitive to density contrasts within the sub-surface and so are ideal for exploring
Kaedah graviti adalah sensitif terhadap perbezaan ketumpatan bahan bawah permukaan bumi dan ideal unuk kegunaan penerokaan
- (a). Forensic geophysics/ *Geofizik forensik*
 - (b). Hydrological investigation/ *Penyiasatan hidrogeologi*
 - (c). Major sedimentary basin study
Kajian lembangan sedimen utama
 - (d). Engineering site investigations/ *Penyiasatan tapak kejuruteraan*
- (12). Which geophysical method is considered “primary method for “leachate and contamination plump” mapping?
Kaedah geofizik yang manakah yang paling utama untuk pemetaan “punca larutlesap dan pencemaran?”
- (a). Resistivity/ *Keberintangan elektrik*
 - (b). Electromagnetics/ *Elektromagnetik*
 - (c). Seismic reflection/ *Seismik pantulan*
 - (d). Self-Potential/ *Keupayaan diri*

(13). Which statement is untrue about velocity-dielectric-resistivity-permittivity relationship in some geophysical survey techniques?

Kenyataan manakah tidak benar mengenai perhubungan sifat-sifat halaju-dielektrik-keberintangan-kebertelusan?

- (a). Resistivity decreases exponentially with porosity
Resistiviti berkurang secara eksponensial dengan keporosan
- (b). Permittivity generally increases with porosity
Kebertelusan amnya meningkat dengan keporosan
- (c). Resistivity exponentially increases with porosity
Keberintangan meningkat secara eksponen dengan keporosan
- (d). Seismic velocity decrease with porosity
Halaju seismic berkurang dengan keporosan

(14). Seismic refraction is a commonly used geophysical technique to determine the following except

Kaedah seismic biasan lazim diguna pakai dalam penentuan kecuali

- (a). Depth-to-bedrock and competence of bedrock
Kedalaman dasar batuan dan ketegaran batuan
- (b). Depth to the water table/ *Kedalaman ke paras air tanah*
- (c). Bedrock lithologic contact and rippability
Litologi batuan dasar dan keboleh kikis
- (d). Elastic Modulus of the rock/ *Modulus keelastikan batuan*

(15). Which statement is untrue about Ground Penetrating Radar (GPR) survey/techniques

Penyataan manakah tidak benar mengenai Kaedah Penusukan Bumi (GPR)

(a). It can detect objects, changes in material, and voids and cracks
Boleh mengesan objek, perubahan bahan, serta rongga dan retakan

(b). GPR uses high-frequency (usually polarized) radio waves (UHF/VHF)

GPR menggunakan gelombang radio (lazimnya terkutub) berfrekuensi tinggi (UHF/VHF)

(c). Apply an EM pulse is sent through an antenna, penetrating into the surveyed material

Menggunakan denyutan EM yang dipancar menerusi antena, menerobosi kedalam bahan yang dikaji

(d). Acoustic energy is used instead of Electromagnetic energy
Tenaga akustik digunakan berbanding tenaga elektromagnetik

(16). Which statement is TRUE about a Spontaneous Potential (SP) in geoelectrical survey methods

Penyataan manakah BENAR mengenai Keupayaan Sepontan (SP) dalam kaedah-kaedah survei geoelektrik

(a). Resistance to movement of charge

Rintangan terhadap pergerakan caj

(b). Measure apparent resistance of ground

Mengukur nilai keberintangan nyata bumi

(c). Measures naturally occurring DC currents

Mengukur arus DC) semulajadi

(d). Measure apparent resistance of ground

Mengukur nilai keberintangan nyata bumi

- (17). Geophysical method that using the natural fields of the Earth, **EXCEPT** *Kaedah Geofizik yang menggunakan (isyarat) medan semulajadi bumi, **KECUALI***
- (a). Gravity and Magnetic survey/ *Tinjauan graviti dan Magnetik*
 - (b). Magnetic and seismic survey/ *Tinjauan Magnetik dan Seismik*
 - (c). Ground Penetrating Radar (GPR)/ *Radar Penusukan Bumi*
 - (d). Induced Polarization (IP) and Gravity Survey
Aruhan Pengutuban (IP) dan Tinjauani Graviti
- (18). Which rock type have significant mafic mineral component and highest magnetic susceptibilities
Batuan manakah yang mempunyai komponen mineral mafik/legap dan ketelapan kemagnetan yang tinggi
- (a). Mafic rocks/ *Batuan mafik*
 - (b). Sedimentary/ *Sedimen*
 - (c). Metamorphic/ *Metamorf/Jelmaan*
 - (d). Felsic rocks/ *Batuan felsik*
- (19). The following are often exercised in gravity data reduction process **EXCEPT** *Pembetulan berikut sering dilakukan dalam proses pembetulan data survei graviti, **KECUALI***
- (a). Instrument drift/ *Rayapan alat*
 - (b). Free air and Bouguer correction
Pembetulan udara bebas dan Bouguer
 - (c). Latitude and Terrain correction/ *Pembetulan Latitud dan Rupa Bumi*
 - (d). Bouguer Anomaly correction/ *Pembetulan Anomali Bouguer*

- (20). The following are wireline logs which widely used to record and to locate the depth of stratigraphic formations in oil field exploration, **EXCEPT** (*Kaedah pengelogan wayer berikut digunapakai secara meluas sebagai rekod untuk menjejak kedalaman formasi stratigrafi penting dalam ekplorasi minyak, **KECUALI***)
- (a). Gamma ray and sonic logging
Pengelogan sinar gamma dan sonik
 - (b). Resistivity and SP logging
Pengelogan keberintangan elektrik dan SP
 - (c). Electrical logging/ *Pengelogan elektrik*
 - (d). Neutron logging/ *Pengelogan neutron*

(20 marks/markah)

PART B / BAHAGIAN B

- (1). Briefly discuss and elaborate the followings.
Secara ringkas takrif dan terangkan perkara-perkara berikut.
- (a). In general, geophysical surveys fall into two classes, survey types and can be carried out in all environment. Elaborate.

Secara umum, survei geofizik terbahagi kepada dua kelas, jenis survei dan boleh dilakukan dalam semua situasi persekitaran. Ulasakan.
 - (b). Briefly discuss the factors that constraint seismic velocities (P and S wave) through any given medium/geological materials such an igneous and sedimentary bedrocks.

Secara ringkas bincang faktor-faktor geologi yang boleh mengekang atau mengawal halaju gelombang seismik (Gelombang P dan S) dalam lapisan batuan seperti igneus dan sedimen.

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- (c). P wave is a function of age and depth of rock. Determine the seismic velocity of underlying rock formation which thickness is 300 meter and geological age of 500 million years.

Gelombang P adalah satu fungsi usia dan kedalaman timbusan batuan. Tentukan halaju seismik formasi batuan dengan ketebalan 300 meter dengan skala usia geologi 500 juta tahun.

(20 marks/markah)

- (2). (a). Briefly discuss or elaborate the followings?

Secara ringkas takrif dan terangkan perkara-perkara berikut

- (i). Magnetic susceptibility, k (in magnetic survey)
Kebolehtahanan magnet, k (in magnetic survey)
- (ii). Induced Magnetisation/ *Kemagnetan teraruh*
- (iii). Non-evasive geophysical survey
Tinjauan geophysical bukan evasif
- (iv). Electromagnetic wave (EM)
Gelombang electromagnetic

(4 marks/markah)

- (b). Other than the ground based magnetic survey, state and discuss two modes of acquiring magnetic survey observations.

Selain daripada Tinjauan Magnetik Bumi, nyatakan dan perihalkan dua bentuk perolehan pemerhatian tinjauan magnetic

(4 marks/markah)

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- (c). Describe the field method of ground magnetic survey
Perihalkan kaedah lapangan tinjauan magnetik bumi.

(8 marks/markah)

- (d). Explain the main application of Magnetic Survey
Terangkan penggunaan utama Tinjauan magnetik

(4 marks/markah)

PART C / BAHAGIAN C

- (3). (a). Briefly with appropriate illustration explain the following parameters /terminologies that are essential in seismic reflection data acquisitions which find wide application in oil exploration industry.

Secara ringkas dengan bantuan ilustrasi yang bersesuaian terangkan maksud parameter/terminalogi berikut yang amat penting dalam pemerolehan dan pemprosesan data seismik pantulan yang meluas diguna pakai dalam industri carigali minyak.

- (i). Common Depth Points (CDP) and Common Middle Point (CMP)
Titik kedalaman sepunya (CDP) dan Titik Tengan Sepunya (CMP)
- (ii). A Seismic reflector/ *Pemantul seismik*
- (iii). Streaming/ *streaming*

(10 marks/markah)

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- (b). (i). What are the electrode configuration/array and geometric factors. List down and illustrates the most common of these electrode arrays in resistivity survey.

Apakah itu konfigurasi/susunan atur elektrod dan faktor geometri. Senaraikan dan ilustrasi susunatur utama elektrod itu dalam survei resistivity/keberintangan

- (ii). Discuss two main survey/investigation methods practiced in earth resistivity techniques.

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

(10 marks/markah)

- (4). (a). What is Free Air Corrected Gravity (***gfa***)? The form of the Free-Air gravity anomaly, ***gfa***, is given by

*Apakah itu pembedulan graviti udara bebas (*gfa*)? Bentuk anomaly *gfa* adalah diberikan oleh*

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

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

*Tentukan nilai Pembedulan gravity (*gfa*) pada suatu stesen graviti yang terletak berhampiran 36.37840544N dengan elevasi 448.96m daripada goeid. Bacaan meter graviti selepas pembedulan pasang surut dan rayapan alat adalah 979149.9 mgal*

(5 marks/markah)

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- (b). Briefly elaborate the use or function of wireline log survey in geological formation evaluation use in Petroleum exploration? State and describe the function of three (3) common type of logs often used.

Secara ringkas terangkan peranan pengelungan wayar atau teknik pengelogan dalam penilaian formasi geologi dalam aktiviti pencarigalian petroleum. Sebut dan terangkan fungsi tiga (3) jenis log yang lazim diguna?

(5 marks/markah)

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

***Jadual A** berikut memberikan data ketibaan masa-jarak yang diperolehi daripada survei seismic pembiasaan di kawasan lanskap yang mendatar*

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TABLE A: Seismic Refraction survey data sheet**Jadual A:** Lembaran data survey Seismik biasan

Geophone no (No Geofon)	Location, X Lokasi X (meter)	Arrival times, t (Ketibaan, t), (S)
Start 0	0	0.0000
1	3	0.0020
2	6	0.0045
3	9	0.0068
4	12	0.0090
5	15	0.0110
6	18	0.0120
7	21	0.0122
8	24	0.0126
9	27	0.0130
10	30	0.0140
11	34	0.0145
12	36	0.0155
13	39.2	0.0160
14	42	0.0165
15	45	0.0170
End 16	48	0.0180

- (i). Plot travel-time graph or T-X plot
Plotkan graf jarak perjalanan-masa atau Plot T-X
- (ii). Determines velocities of layers
Tentukan halaju-halaju lapisan-lapisan itu
- (iii). Thickness of overburden of upper layer, t
Ketebalan lapisan beban atas, t

(10 marks/markah)

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- (5). (a). Briefly discuss the principles of Ground Penetrating Radar (GPR). Explain your answer in term of how this method works.

*Secara ringkas bincangkan prinsip Radar Tusukan Bumi (GPR).
Jelaskan jawapan anda berdasarkan bagaimana kaedah cara kerjanya.*

(8 marks/markah)

- (b). Describe the advantages of GPR application.

Terangkan kelebihan penggunaan GPR

(4 marks/markah)

- (c). Rock and the earth's magnetic field; Elaborate the remnant Magnetization, and Detrital Remnant Magnetization (DRM) and the effect to interpretation of magnetic data.

Batuan dan medan magnet bumi; Jelaskan Pemagnetan Baki dan Pemagnetan Baki Detrital (DRM) dan kesan kepada interpretasi magnetic data.

(4 marks/markah)

- (d). Compare the advantage of applying the GPR and magnetic survey.

Bandingkan kelebihan penggunaan GPR dan Tinjauan Magnetik

(4 marks/markah)

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