

**PART A / BAHAGIAN A**

- (1). (a). How to remove the effect of data clustering in local or global estimation (De-clustering).

*Bagaimana menyisihkan kesan data tertumpuk dalam pengiraan setempat atau rantau (nyah-cluster).*

(5 marks/markah)

- (b). Discuss six steps in mineral resources estimation starting from geological interpretation and domaining of the data to ore reserve classification.

*Terangkan enam langkah di dalam pengiraan jumlah sumber mineral bermula daripada interpretasi geologi and pembahagian domain hingga pengkelasan rizab bijih.*

(12 marks/markah)

- (c). Explain the meaning of the Kriging method in mineral resources estimation and its advantages over traditional method.

*Terangkan maksud kaedah Kriging di dalam penentuan jumlah sumber mineral dan kelebihan berbanding kaedah tradisional.*

(3 marks/markah)

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- (2). A mining company plan to open a gold mine. Two potential mining method was investigated and its cashflow was prepared as follow:

*Sebuah Syarikat perlombongan merancang untuk membuka sebuah lombong emas. Dua kaedah perlombongan telah dikaji dan aliran tunainya disediakan, seperti berikut:*

	<b>Capital Cost</b> <i>Kos Modal</i> (RM)	<b>Annual Cashflow</b> <i>Aliran Tunai</i> <i>Tahunan</i> (RM)	<b>Mine Life</b> <i>Hayat</i> <i>lombong</i> (Year/Tahun)
<b>Mining Method A</b> <i>Kaedah</i> <i>Perlombongan A</i>	3,500,000	900,000	12
<b>Mining Method B</b> <i>Kaedah</i> <i>Perlombongan B</i>	5,000,000	1,200,000	12

You are requested to evaluate and conduct analysis study on the cashflow and to endorse which method should be chosen and explain why.

*Anda diminta untuk menjalankan kajian analisis aliran-aliran tunai berkenaan dan memberi perakuan kaedah mana yang patut dipilih beserta dengan alasan-alasan pemilihannya sekali*

(20 marks/markah)

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**PART B / BAHAGIAN B**

- (3). (a). Typical mining project stage involve feasibility studies, detailed design and construction and commissioning. Discuss and elaborate.

*Suatu projek perlombongan melibatkan beberapa peringkat termasuk kajian kebolehlaksanaan, pembinaan dan reka bentuk lengkap, dan 'commissioning'. Bincang dan ulas.*

(5 marks/markah)

- (b). Explain and discuss the effect of change in metal price on mining operations. Relate this with supply and demand of minerals

*Terangkan dan bincangkan kesan perubahan harga logam terhadap operasi perlombongan. Kaitkan dengan bekalan dan permintaan mineral.*

(5 marks/ markah)

- (c). The demand for any mineral is shaped by factors impacting directly on the mineral or mine site and by factors influencing the derived demand. Explain the impacting factor and derived demand for any mineral.

*Permintaan untuk sebarang mineral ditentukan oleh kesan terus faktor mineral atau lombong dan hasil pengaruh faktor permintaan. Terangkan kesan faktor dan permintaan untuk sebarang mineral.*

(5 marks/ markah)

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- (d). A project that has a negative cash flow would not provide meaningful results in the discounted cash flow method. The cash flow of the project was found to have a negative value is shown in Table 1. If the cost of capital is 10%, get the adjusted cash flow for the project.

*Suatu projek yang mempunyai aliran tunai negatif tidak akan memberikan keputusan bermakna dalam kaedah aliran tunai terdiskaun. Aliran tunai suatu projek didapati mempunyai nilai negatif seperti yang ditunjukkan dalam Jadual 1. Jika kos modal ialah 10%, dapatkan aliran tunai terlaras bagi projek berkenaan.*

**Table 1/ Jadual 1**

<i>Tahun</i>	<b>0</b>	<b>1 ke 5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>Aliran Tunai</b>	-2500	950	1100	1250	-2500

(5 marks/markah)

- (4). (a). Explain feasibility study of a mining project. Discuss also important aspect by giving examples.

*Terangkan kajian kebolehlaksanaan sesuatu projek perlombongan. Bincangkan juga aspek penting dengan memberikan beberapa contoh.*

(5 marks/ markah)

- (b). Explain how to estimate the total capital cost for a new mining project

*Terangkan bagaimana anda boleh menentukan jumlah kos modal untuk satu projek perlombongan yang baru*

(5 marks/ markah)

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- (c). Explain the estimation of operational cost involved in a mining project.

*Terangkan Anggaran Kos Operasi yang terlibat dalam sesuatu projek perlombongan.*

*(5 marks/ markah)*

- (d). Compare and explain in detail the following types of investment appraisal

- (i). Net Present Value (NPV)
- (ii). Internal Rate of Return (IRR)
- (iii). Discounted Cash Flow (DCF)

*Banding dan terangkan dengan lengkap jenis-jenis penilaian pelaburan berikut:*

- (i). *Nilai kini bersih (NKB)*
- (ii). *Kadar pulangan dalaman (KPD)*
- (iii). *Aliran Tunai Terdiskaun (ATT)*

*(5 marks/ markah)*

- (5). Cash flow for a mining project are as given in the following table:  
*Unjuran aliran tunai untuk satu projek perlombongan adalah seperti berikut:*

<b>Year Tahun</b>	<b>Capital Expenditure Perbelanjaan Modal (RM 000)</b>	<b>Gross Income Pendapatan Kasar (RM 000)</b>	<b>Operating Cost Kos Operasi (RM 000)</b>
-3	1000		
-2	1000		
-1	4000		
0	7000		
1		9000	4000
2		9000	4100
3		13000	4200
4		13000	4300
5		12000	4400

70% of the Capital Cost was used for mine development while remaining 30% was used to buy mining land.

If:-

- (i). Depreciation was done equally for 4 years beginning year 1
- (ii). Depletion was done equally for 5 years beginning year 1
- (iii). Income tax paid at 40% rate
- (iv). Capital cost is 10%

*Andainya :-*

- (i) *Susut nilai dilaksanakan sama rata selama 4 tahun bermula tahun 1*
- (ii) *Pemupusan dilaksanakan sama rata selama 4 tahun bermula tahun 1*
- (iii) *Cukai pendapatan dibayar pada kadar 40%*
- (iv) *Kos modal adalah 10%*

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Calculate / *Kirakan:*

- (a). The total net income cash flow for the project  
*Jumlah aliran tunai bersih untuk projek*  
( 4 marks/markah)
- (b). The net cash flow present value at capital cost  
*Nilai kini aliran tunai bersih pada kos modal*  
( 6 marks/markah)
- (c). The discounted cash flow internal rate of return for the project  
*Kadar pulangan dalaman aliran tunai terdiskaun untuk projek*  
( 7 marks/markah)
- (d). The payback period  
*Tempoh bayar balik aliran tunai tersebut*  
( 3 marks/markah)

**PART C / BAHAGIAN C**

- (6). (a). Based on the drillhole data, the variogram value for every lag distance can be calculated. The result of the calculation as in Table 1. Plot and fitting the variogram model for every lag distance in Table 1. Mark three parameters that can be obtained from the variogram model and explain the meaning of those parameters.

*Berdasarkan kepada data drillhole, nilai variogram untuk setiap jarak lag boleh dikira. Hasil pengiraan adalah seperti di dalam Jadual 1, lukiskan and sempurnakan model variogram untuk setiap jarak lag. Tunjukkan tiga parameter yang boleh diperolehi*

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dari model variogram dan terangkan maksud bagi semua parameter.

Table 1: Lag distance (h) and variogram value for every 2 m

Lag distance	h	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
Variogram value	$\gamma(h)$	2	3	4	5	5	5	6	6	6	8	5	6	7	11	15	32

(10 marks/markah)

- (b). What is the meaning of ore reserve? Ore reserves are sub-divided into Probable and Proved. Define the main difference of Proved and Probable.

Apakah maksud rizab bijih? Rizab bijih dibahagikan kepada Proved dan Probable. Perihalkan perbezaan utama "Proved" dan "Probable".

(5 marks/markah)

- (c). Cross validation of the resources block model vs actual borehole data is required to check the similarity of the estimation results and the raw (drillhole) data. Give three methods of cross validation. Illustrate one of your answers with the graphical explanation

Validasi melintang terhadap blok model sumber vs data lubang bore yang sebenar diperlukan untuk memastikan kesamaan hasil penganggaran dan data (lubang bore). Berikan tiga kaedah validasi melintang. Lakarkan salah satu jawapan anda dengan penerangan grafik

(5 marks/markah)

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- (7). (a). Based on the Figure 1 below, calculate value 'X' by inverse distance square method and polygonal local sample mean method within the search radius. Which method you think is much better and what is the reason.

Berdasarkan gambarajah 1, kirakan nilai 'X' dengan kaedah jarak songsang kuasa dua dan kaedah poligon purata nilai sampel setempat di dalam kawasan perimeter carian. Kaedah mana anda fikir lebih baik dan sebabnya.

(12 marks/markah)

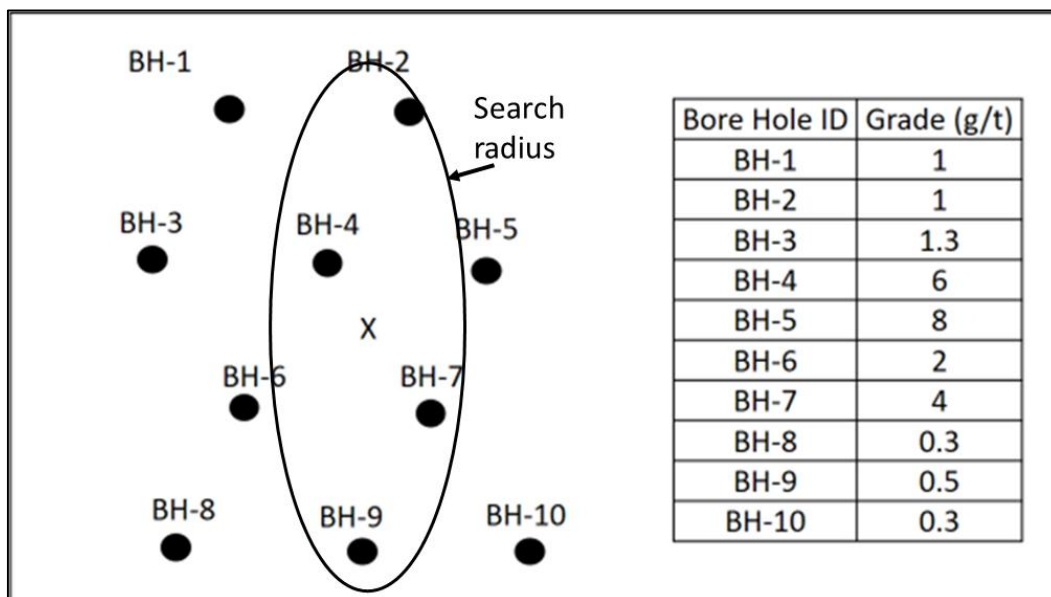


Figure 1: Distribution of sampling data (BH-1 - BH-10) and grade.

Distance of 'X' to BH-4 and BH-7 are 5 meters. Distance of 'X' to BH-9 and BH-2 are 12 meters.

Figure 1: Taburan data pesampelan (Bh-1 – BH-10) dan nilai gred. Jarak 'X' ke BH-4 and BH-7 adalah 5 meter. Jarak 'X' ke BH-9 and BH-2 adalah 12 meter.

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- (b). Geostatistical method or spatial interpolation involving the Kriging method. Kriging method can be divided into linear and non-linear method. List down two types of linear kriging and two type of non-linear method. State the main different in application that separate both types.

*Kaedah geostatistik atau interpolasi ruang melibatkan kaedah Kriging. Kaedah Kriging boleh dibahagikan kepada kaedah linear dan kaedah bukan linear. Senaraikan dua jenis kaedah linear dan dua kaedah bukan linear. Nyatakan perbezaan utama dalam penggunaan yang membezakan kedua-duanya.*

(5 marks/markah)

- (c). List one advantage and two disadvantages of the Kriging method. *Berikan satu kelebihan dan dua kekurangan kaedah Kriging.*

(3 marks/markah)

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