UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2012/2013

January 2013

EBS 311/3 – Mining Methods & Law
[Kaedah-kaedah Perlombongan & Undang-undang]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains THIRTEEN printed pages before you begin the examination.
[Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGA BELAS muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

This paper consists of SEVEN questions.
[Kertas soalan ini mengandungi TUJUH soalan.]

Instruction: Answer **FIVE** questions. If candidate answers more than five questions only the first five questions answered in the answer script would be examined.
*[**Arahan**: Jawab **LIMA** soalan. Jika calon menjawab lebih daripada lima soalan hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.]*

The answers to all questions must start on a new page.
[Mulakan jawapan anda untuk semua soalan pada muka surat yang baru.]

You may answer a question either in Bahasa Malaysia or in English.
[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

In the event of any discrepancies, the English version shall be used.
[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.]

1. [a] **Describe** three (3) categories of an underground mining methods based on its supporting mechanism. List two (2) examples for each category.

Perihalkan *dengan ringkas tiga (3) kategori kaedah perlombongan bawah tanah berdasarkan mekanisma sokongan. Senaraikan dua (2) contoh bagi setiap kategori.*

(30 marks/*markah*)

[b] **Discuss** the characteristics of the ore deposit that suites best for underground mining method as follows. List one (1) advantage and disadvantage respectively for each method.

Bincangkan *ciri-ciri endapan bijih yang bersesuaian dengan kaedah perlombongan di bawah. Senaraikan satu (1) kebaikan dan keburukan setiap kaedah.*

(i) Block Caving.
Perampakan bongkah.

(15 marks/*markah*)

(ii) Sublevel caving.
Perampakan subparas.

(15 marks/*markah*)

(iii) Room and Pillar.
Bilik-dan-tiang.

(20 marks/*markah*)

(iv) Cut and Fill.
Potong-dan-isi.

(20 marks/*markah*)

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2. [a] Briefly **describe** the following:

(i) Recovery.

(ii) Dilution.

(iii) Possible reserves.

(iv) Probable reserves.

(v) Proven reserves.

Terangkan *dengan ringkas istilah berikut:*

(i) Perolehan.

(ii) Pencairan.

(iii) Rizab berkemungkinan.

(iv) Rizab barangkali.

(v) Rizab terbukti.

(25 marks/*markah*)

[b] **Explain** on the reasons and conditions in which an underground mine is pre-eminent than a surface mine.

Jelaskan *sebab-sebab dan keadaan di mana penggunaan kaedah lombong bawah tanah adalah lebih baik berbanding kaedah lombong permukaan.*

(15 marks/*markah*)

[c] With the aid of a diagram, **comment** on the coal deposit characteristic and geological settings (depth, size and shape) of a coal seam for transportation purpose (using the skip or conveyor belt). Assume that the main coal seam deposit lies within the horizontal direction for the underground main access opening.

(i) Drift (or adit).

(ii) Slope (inclined shaft).

(iii) Vertical shaft.

Dengan bantuan gambarajah, ***komen*** *berkenaan kriteria endapan arang batu dan keadaan geologi (kedalaman, saiz dan bentuk endapan) yang paling sesuai bagi tujuan pengangkutan (sama ada menggunakan skip atau tali sawat) untuk bukaan lombong bawah tanah berikut. Andaikan lapisan lipit arang batu adalah pada kedudukan melintang.*

(i) Kolong (atas odit).

(ii) Cerun (syaf condong).

(iii) Syaf menegak.

(60 marks/*markah)*

3. [a] **Compute** the blasting pattern for the bench of a surface mine shown in cross section in the Figure 1 below, given these data:

- Copper ore specific weight (w) = 2.5 tan/m^3
- Bank Length (L) = 75 m
- Explosive = ANFO
- Loading Density (r) = 108 kg/m
- Powder Factor (PF) = 0.27 kg/tone
- Height of Charge in Hole (k) = 12 m
- Hole Diameter (d) = 305 mm

Kirakan *pola peletupan undak bagi lombong permukaan seperti yang ditunjukkan di dalam Rajah 1 berdasarkan maklumat berikut:*

- *Jisim spesifik bijih besi (w) = 2.5 tan/m^3*
- *Panjang tebing (L) = 75 m*
- *Bahan letupan = ANFO*
- *Ketumpatan isian (r) = 108 kg/m*
- *Faktor serbuk (PF) = 0.27 kg/tan*
- *Ketinggian lubang letup (k) = 12 m*
- *Diameter lubang letup (d) = 305 mm*

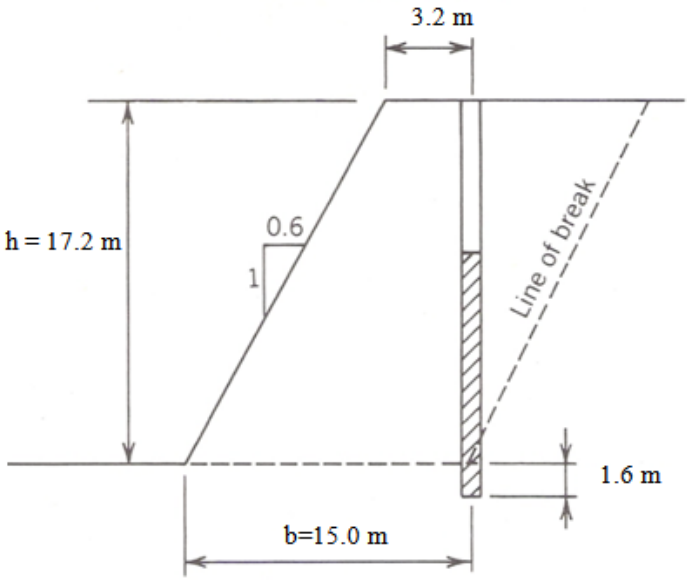

Figure 1: Blasting pattern for the bench of a surface mine

Rajah 1: Pola peletupan undak bagi lombong permukaan

(i) Bank area (A).

Luas tebing (A).

(10 marks/*markah)*

(ii) Bank Volume (V).

Isipadu tebing (V).

(10 marks/*markah)*

(iii) Bank Weight (W).

Berat Tebing (W).

(10 marks/*markah)*

(iv) Weight of Charge/Drillhole (c).

Berat Cas/Lubang Letup (c).

(10 marks/*markah)*

(v) Weight of broken/drillhole (m).
Berat batu pecah/lubang letup (m).

(10 marks/*markah)*

(vi) Number of drill holes needed (n).
Jumlah lubang letup diperlukan (n).

(10 marks/*markah)*

(vi) Drill Hole spacing (s).
Jarak lubang gerudi (s).

(10 marks/*markah)*

[b] The above design (Question 3a) was modified by increasing the powder factor to 0.32 kg/tonne. **Review** the effect on hole spacing and number of drill hole required.
Note: Partial credit will be given for calculation.

*Pola peletupan di atas (Soalan 3a) telah diubahsuai dengan meningkatkan faktor serbuk kepada 0.3 kg/tan. Beri **ulasan** terhadap kesan kepada jarak lubang dan jumlah lubang letup yang diperlukan.*
Nota: Sebahagian markah akan diberi untuk pengiraan.

(30 marks/*markah)*

4. The following data are given for a mineral deposit occurring under condition similar to Figure 2:

- Value of ore = RM8.50/tonne
- Costs (excluding stripping) = RM5.52/tonne
- Stripping cost (for overburden of e=1) = RM0.42/m^3
- Berm (a) = 0.2 m
- Dip of deposit (α) = 23º
- Pit slope (β) = 62º
- Deposit thickness (t) = 23.2 m
- Equivalent Cubic meter (e) = 1.88/tonne
- Tonnage Factor (TF) = 0.54m^3/tonne

Diberikan data berikut untuk kondisi jasad bijih seperti dalam Rajah 2:

- *Nilai bijih = RM8.50/tan*
- *Kos (tidak termasuk pelucutan beban) = RM5.52/tan*
- *Kos Pelucutan (untuk beban e=1) = RM0.42/m^3*
- *Tanggaan (a) = 0.2 m*
- *Kemiringan Jasad Bijih (α) = 23º*
- *Cerun Lelubang (β) = 62º*
- *Ketebalan Jasad Bijih(t) = 23.2 m*
- *Kiub Meter Setara (e) = 1.88/tan*
- *Faktor Tanan (TF) = 0.54m^3/tan*

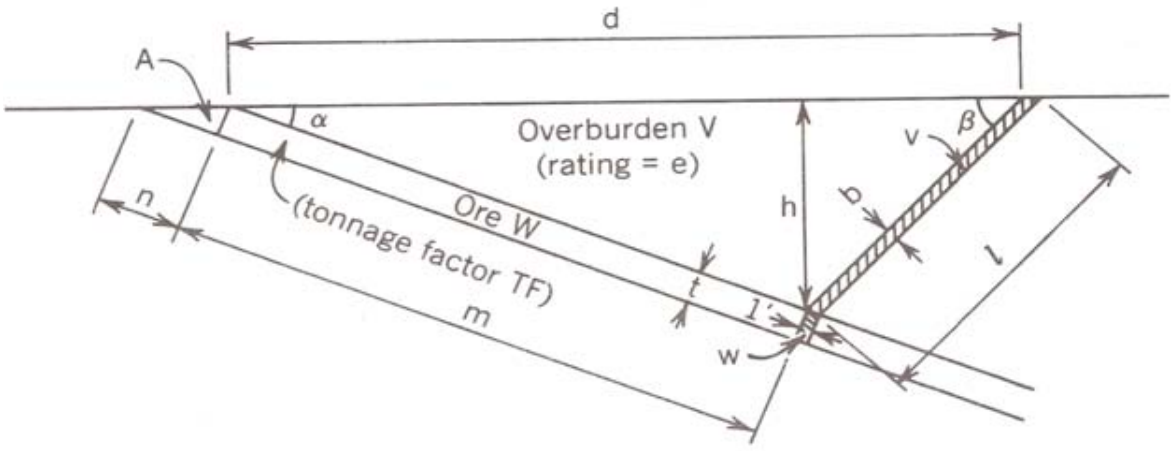

Figure 2: A mineral deposit occurring

Rajah 2: Kondisi jasad bijih

[a] **Calculate** the maximum allowable stripping ratio (SR_{max}).

Kirakan *kadar pelucutan basi maksima (SR_{max}).*

(20 marks/*markah)*

[b] **Determine** the pit limit for the deposit in terms of h.

Tentukan *had lelubang untuk jasad tersebut dalam bentuk h.*

(30 marks/*markah)*

[c] **Calculate** the Overall Stripping Ratio (SR_o).

Kirakan *kadar pelucutan keseluruhan (SR_o).*

(50 marks/*markah)*

5. [a] With the aid of a sketch, **explain** the traditional procedures (polygonal method) for reserve estimation by areas of influence based on the drillholes pattern as given in the Figure 3.

Dengan bantuan lakaran, ***terangkan*** *prosedur tradisional (kaedah poligon) untuk tujuan penganggaran rizab kawasan pengaruh berdasarkan kedudukan lubang letup seperti yang ditunjukkan dalam Rajah 3.*

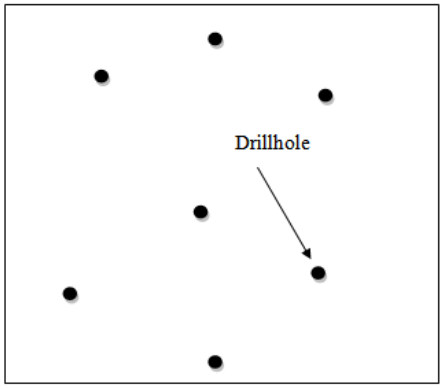

Figure 3: Drillhole pattern

Rajah 3: Kedudukan lubang gerudi

(60 marks/*markah*)

[b] **Estimate** the unit profit in mining and processing a 0.55% copper ore deposit if the selling price of copper in the concentrate is RM 3.68/kg and overall unit costs are RM12.35/tonne. Overall recovery is 89%.

Calculate the cutoff grade for the copper deposit.

Anggarkan *kadar keuntungan bagi perlombongan dan pemprosesan 0.55% endapan bijih tembaga berdasarkan harga konsentrat tembaga pada RM3.68/kg dan kos keseluruhan pada RM12.35/tan. Perolehan keseluruhan adalah 89%.*

Kirakan *gred penggalan bagi endapan tembaga tersebut.*

(40 marks/*markah*)

6. [a] How do you apply for an area for mining purposes and state the documents required for this application.

Bagaimanakah anda memohon suatu kawasan untuk tujuan melombong dan nyatakan dokumen-dokumen yang diperlukan bagi permohonan ini.

(50 marks/*markah*)

[b] Write brief notes on the following topics in accordance to the requirements of the mining laws.

(i) Mining Land.

(ii) Explosives Magazine.

(iii) Operational Mining Scheme.

(iv) Tailing Retention Ponds.

(v) Prefeasibility Report.

Tuliskan nota ringkas ke atas tajuk berikut menurut keperluan undang-undang melombong.

(i) *Tanah Lombong.*

(ii) *Magazin Bahan Letupan.*

(iii) *Skim Pengendalian Melombong.*

(iv) *Kolam-kolam Pengumpulan Hampas.*

(v) *Laporan Prakebolehlaksanaan.*

(50 marks/*markah*)

7. Briefly discuss the following questions.

Jelaskan semua soalan/situasi berikut seberapa ringkas yang boleh.

[a] What is the difference between prospecting license and exploration license?

Apakah perbezaan di antara lesen mencarigali dan lesen penjelajahan?

(10 marks/*markah*)

[b] Why is it a requirement to have a shotfiring license in any blasting operation in any mine or quarry?

Kenapakah diperlukan suatu lesen pembedil bagi apa-apa kegiatan peletupan di mana-mana lombong atau kuari?

(10 marks/*markah*)

[c] You have obtained a mining lease, could you start mining operation immediately and give reason for your answer.

Anda sudah memperolehi satu pajakan melombong, bolehkah anda terus memulakan kegiatan melombong dan berikan sebab atas jawapan anda.

(10 marks/*markah*)

[d] Your quarrying operation is having a problem mainly due to the unreasonable requirements from a corrupt public servant. What should you do?

Kegiatan kuari anda menghadapi masalah hanya disebabkan oleh keperluan yang tidak munasabah daripada seorang pegawai awam yang korap. Apakah yang patut anda lakukan?

(10 marks/*markah*)

[e] Ahmad has a rubber estate and found a mineral deposit and he wishes to mine the deposit. What should he do?

Ahmad ada satu ladang getah dan didapati ada mendapan mineral dan dia mahu melombong mendapan ini. Apakah yang patut dia lakukan?

(10 marks/*markah*)

[f] A quarry manager wishes to store explosives in his quarry area. To whom should he apply for a license to store the explosives?

Seorang pengurus kuari mahu menyimpan bahan letupan di dalam kawasan kuarinya. Kepada siapakah dia boleh memohon lesen menyimpan bahan letupan?

(5 marks/*markah*)

[g] What are the requirements in storing explosives in any mines or quarries?

Apakah keperluan-keperluan bagi penyimpanan bahan letupan di dalam mana-mana lombong atau kuari?

(10 marks/*markah*)

[h] Why a prefeasibility study report is required in applying for a mining land?

Kenapakah satu laporan kajian prakebolehlaksanaan diperlukan dalam memohon tanah lombong?

(10 marks/*markah*)

[i] Ali is a professional engineer in the discipline of civil engineering. Is he qualified to act as a consultant in the mining operation of a gold mine? State your reason.

Ali adalah seorang jurutera profesional dalam bidang kejuruteraan awam. Adakah ia layak untuk menjadi konsultan dalam kegiatan melombong bagi sebuah lombong emas? Nyatakan sebab-sebab anda?

(10 marks/*markah*)

[j] A top ranking public servant whose qualification is in public administration, gave a direct order to a mine to stop operation for safety reason. Is he allowed to do that? If you are the mine manager, what should you do when you face this kind of situation.

Seorang pegawai awam berpangkat tinggi yang berkelulusan dalam bidang pengurusan awam, memberi arahan terus kepada sebuah lombong untuk memberhentikan kegiatan melombong atas alasan keselamatan. Adakah dia dibolehkan melakukan sedemikian? Sekiranya anda pengurus lombong, apakah yang patut anda lakukan apabila berdepan dengan keadaan sedemikian?

(15 marks/*markah*)

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